Railway Age

DAILY EDITION

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WE GUARANTEE that of this issue, 17,100 copies were printed; that of these 17,100 copies, 15,406 were mailed to regular paid subscribers to the Railway Age and the Railway Mechanical Engineer; 119 were mailed to advertisers, 300 were provided for counter and news companies' sales, new subscriptions, bound volumes, copies lost in the mail and office use; and 1,275 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Audit Bureau of Circulations (A. B. C.) and the Associated Business Papers. (A. B. P.)

To preside over a large convention meeting is not an easy task even under the most favorable circumstances. At the sessions held last week, the difficulty was increased by the poor acoustic properties of the auditorium, and the retiring chairman is to be congratulated on the way in which he handled the situation. Chairman Chambers demonstrated that he possesses in a marked degree the qualities that go to make up a good presiding officer. He showed his familiarity with parliamentary law and, regardless of the complexity of the situation resulting from motions, amendments and protracted discussion, never became confused. He was impartial in his attitude and encouraged full and free discussion, but held the meetings in hand at all times and was decisive, though never arbitrary, when decisions were required. Among the factors that contributed to the success of the meetings, Mr. Chambers' work as presiding officer deserves recognition.

An Executive in the Chair

"Post Graduate Courses" for Officers

IN HIS ADDRESS before the Mechanical Section yesterday, W. T. Tyler referred to the annual convention and exhibit as a "post-graduate course in railroading" for those attending. This is a very good description of the purpose which the convention and exhibit serve. The time never comes when any professional man can safely consider his education in his special line finished. The moment he begins to consider it finished and to act accordingly, he begins to retrograde, for in every line of professional activity new discoveries and developments constantly are occurring, and no man can keep up with them who does not make unflagging efforts to do so. All this applies without qualification to the technical men of railroads. The important developments in their field do not all take place in the railroads. Many of the most important of them occur in the laboratories, the manufacturing plants and the offices of railway supply concerns. From them proceed a very large part of all the improvements in railway equipment and devices. No railway man can visit the laboratories and factories of all the equipment and supply concerns. On the other hand, every railway man, by participating in the annual meetings of the Mechanical Section, and carefully inspecting the exhibits made in connection with them, can do a great deal toward keeping abreast of all the important developments in his field, both those which originate on the railroads and those which originate with the equipment and supply companies. It would be an excellent thing if Mr. Tyler's suggestion that the spring meeting of the American Railroad Association be held at a time and place when and where the operating executives of the railroads could visit the exhibit should be adopted. The operating executives need "post-graduate courses" as well as the mechanical officers.

An Innovation in Locomotive Design

ABOUT TWO AND A HALF YEARS ago the Pennsylvania Railroad built a Decapod locomotive, in the design of which the principle of the short maximum cut-off was first incorporated in a simple locomotive. The design was a development from the class L1s Mikado type, which was exhibited at the 1914 conventions, the boiler being essentially the same so far as proportions and capacity are concerned, with the notable exception that the working pressure was raised from 205 lb. to 250 lb.

By increasing the size of the cylinders and increasing the steam lap of the valve, the maximum possible cut-off was reduced from about 85 per cent to 50 per cent, thereby materially reducing the steam consumption of the engine when working at slow speeds. Advantage of the decreased steam consumption was taken to increase the tractive effort, which was increased about 40 per cent over that of the Mikado. The simple Mallet locomotive is the next step in the application of this principle.

A comparison of the characteristics of the compound with the simple locomotive show a decided advantage in the speed to which the maximum tractive effort may be maintained before the capacity of the boiler is exceeded. This is, obviously, due to the expansive working of the steam. The simple engine with short maximum cut-off possesses essentially the same characteristics in this respect as the compound locomotive, and it is this fact which gives promise of providing sufficient boiler capacity to take care of two sets of simple cylinders. The compound engine differs, however, from the short cut-off simple engine in that the full expansion takes place in a single cylinder with the disadvantage of smaller temperature differences in the cylinder walls. But with superheated steam this advantage is largely discounted.

This design, however, involves another feature which is decidedly to the disadvantage of the simple engine. This is the stresses to which the running gear is subjected. With a cut-off between 85 and 90 per cent of the full stroke the maximum pressure at any point in the stroke is comparative uniform and is very little higher than the mean effective pressure, on which the tractive effort depends. With the short cut-off, however, the maximum pressure is much higher. On a rough estimate, the maximum pressure with the long cut-off is about 17 per cent higher than the mean effective pressure, while with 50 per cent cut-off it will

probably be more than 60 per cent higher. There is no difficulty in designing the parts to provide adequate strength, but increased difficulties of maintenance may be expected. The driving box, with its crown type of bearing, is not well adapted to take heavy thrusts, a fact which already has resulted in increased maintenance of main boxes on large power. The added thrusts which must be resisted with the 50 per cent cut-off will increase the difficulties of keeping these boxes in good condition. There is no inherent objection to the short cut-off from the strength standpoint, but to provide ample strength the weight of frames, rods and pins must be increased.

There is nothing on which to base a prediction as to the ultimate success of the idea; it must rest upon a careful weighing of the advantage as demonstrated in service with the above-mentioned disadvantages. Applied to the Mallet locomotive, however, as a substitute for compounding, it does not possess the advantages which might be expected when compared with the usual type of simple locomotive.

The Tank Car Situation

THE REMARKS OF COL. B. W. DUNN during Friday's session on the seriousness of the danger and economic loss in connection with the transportation of gasoline in tank cars, placed before the Mechanical Section a matter which should receive the very serious thought of the members. The bottom discharge valve is the greatest source of trouble and is most in need of attention. The solution of this safety value and dome cap questions offer less difficulty. The inadequacy and unsatisfactory nature of the type of valve generally used at present was clearly indicated in the report of the Tank Car Committee and in the individual discussion of the bottom outlet valve by Chairman Gibbs. The principal point of difference between the committee and Colonel Dunn seems to be in their respective attitudes toward the proper methods of improving the situation. Mr. Gibbs' remarks, tacitly at least, recognize the bottom outlet valve as a necessary adjunct of these cars, but strongly recommends its improvement. Colonel Dunn points out that, since 20 years have elapsed without the development of a satisfactory device, it is unreasonable to expect any better results from future attempts at improvement.

For cars handling volatile liquids exclusively there seems to be no good reason why the bottom outlet should not be eliminated, as these liquids can very readily and satisfactorily be unloaded through the dome by several methods and the equipment required for top unloading is not of such a nature that its installation can be considered burdensome when the advantages of the elimination of the bottom valve in decreased danger and loss of lading is considered. There may be some difficulty in top unloading of some of the viscous products commonly handled in tank cars, which would make the elimination of the bottom valve burdensome to those having to do with such products. The matter, however, is one which must be determined on the broad grounds of country wide economy and safety and it will probably be impossible to arrive at a final solution which adequately considers the matter of safety and freedom from loss of volatile products, that will be entirely satisfactory to shippers of other products. It would be better to provide special equipment to meet the requirements of such cases than to perpetuate present conditions as they effect the vastly greater volume of traffic in highly inflammable volatile products. Such a solution of the problem is not impracticable when it is considered that the greater part of the tank car equipment of the country is privately owned and built for use in one class of traffic and that the volume of traffic in products which cannot readily be handled in a car designed for volatile products are comparatively of very small volume.

Training for Car Department Men

IN THE COURSE OF HIS ADDRESS at Saturday's meeting, F. W. Brazier gave some interesting data concerning the relative expenditures for labor and material in the car department. He quoted statistics which showed that wages formed approximately 60 per cent of the total expenditure for the maintenance of cars. This fact is of peculiar significance, coming, as it does, at the end of a four days' session devoted to discussions of the problems of the car department. During these meetings committee reports were presented dealing with questions involving various phases of operation, design, the technical aspect of equipment maintenance and the efficiency of materials and devices. During the entire session not a single report was presented which dealt in any way with labor matters; in other words, the attention of the committee has been devoted entirely to methods of saving a part of the 40 per cent spent for material, while the 60 per cent spent for labor has been ignored.

The natural inference that would be drawn from this fact is that labor conditions are entirely satisfactory and there is no opportunity for improvement. Such an idea would be promptly dispelled by reading the discussion of the report of the Committee on Car Construction. In the course of this discussion there were repeated references to the inability to secure good workmanship from the present day car repairers and the butt splice for car sills was adopted in preference to the ship lap splice, partly at least because the butt splice is easier to make.

Is it not time for the members of the mechanical associations to abandon their attitude of indifference toward the problems connected with the efficiency of labor? The by-laws of the Master Car Builders' Association prohibited the discussion of rates of wages or hours of labor. Even granting that the consideration of these particular questions by the Mechanical Section might be unwise, it is, nevertheless, a fact that the training of men to increase their efficiency is a subject which demands attention and to which no valid objection could be offered. The need for systematic training is proved when the master car builders agree that formerly the car department employees were competent mechanics, but now it is necessary to "put something easy in the rules so that the mechanics can work it out."

It is doubtful whether there is a road in this country that has a system of training car men that is satisfactory under present conditions. A consistent quality of developing the personnel of the car department is needed to reduce the labor turnover, to train skilled mechanics and to provide capable executives in the future. At the present time some roads are preparing comprehensive instructions for the guidance of car repairers. Such a policy, in conjunction with an apprentice course, should bring about a marked betterment in labor conditions.

The results of the methods developed to improve the labor situation might well be considered in a topical discussion at next year's convention. There is some question whether the Mechanical Section will confine itself to technical problems or whether it will broaden its activities to embrace all matters concerning the mechanical department. The decision which the officers and members come to will be watched with interest.

Program For Today

9.30 A. M. TO 1.30 P. M.

Address of Vice-Chairman.....	9.30 A. M. to 10.30 A. M.
Action of Minutes of 1918 Annual Meeting (M. M.)	10.30 A. M. to 10.35 A. M.
Reports of Secretary and Treasurer (M. M.)	10.35 A. M. to 10.50 A. M.
Discussion of Reports on: Standards Recommended Practice (M. M.)..	10.50 A. M. to 11.20 A. M.
Mechanical Stokers	11.20 A. M. to 11.50 A. M.
Individual Paper on "Standardization," by Mr. Frank McManamy...	11.50 A. M. to 12.30 P. M.
Questions Proposed by Members....	12.30 P. M. to 1.30 P. M.

10.30 A. M.—Band Concert. Entrance Hall, Million Dollar Pier. Royal Scotch Highlanders' Band.

3.30 P. M.—Orchestral Concert and Impromptu Dancing. Entrance Hall, Million Dollar Pier. Fry Philharmonic Orchestra. Tea will be served at 4.30 P. M., in Entrance Hall.

9.00 P. M.—Major E. D. Campbell, Railway and Seacoast Section, Artillery Division, Ordnance Department, United States Navy, will make an address in the Hippodrome on "Railway Artillery." There will be an Informal Dance in the Ball Room, Million Dollar Pier. Royal Scotch Highlanders' Band.

W. T. Tyler to Speak Monday

W. T. TYLER, DIRECTOR OF OPERATION of the Railroad Administration, will deliver another brief address before the Convention on Monday morning.

Meeting of General Committee

THERE WILL BE a meeting of the new General Committee of Section III—Mechanical, American Railroad Association, at 4.00 P. M. on Monday, at the Marlborough-Blenheim. Members of the retiring Executive Committee are also invited to attend.

The Lecture Tonight

THE LECTURE ON RAILWAY ARTILLERY, which is to be delivered in the Hippodrome at 8.30 tonight by Major E. D. Campbell, Railway and Seacoast Section, Artillery Division, Ordnance Department, United States Army, should provide interesting entertainment from the popular as well as the engineering standpoint. Major Campbell was with the Ordnance Department throughout the war, following the development and progress of railway artillery from the very beginning, and is therefore specially well fitted to speak on this subject. The lecture will be accompanied by descriptive moving pictures and lantern slides.

Don't Fail to See the Big Guns

THE EXHIBIT of the Baldwin Locomotive Works, which is located on Georgia Avenue, three blocks below the pier, is of unusual interest. Through the courtesy of the United States Navy, two gun mounts are exhibited—one a railway mount carrying a 14-inch gun and the other a caterpillar mount carrying a 7-inch gun. The big gun is manipulated at 11.00 A. M. and 3 P. M. The 14-inch mount represents an improvement over a number which were built during the war, and were used in action in France. The mounts were constructed by the Baldwin Locomotive Works and the guns by the Midvale Steel and Ordnance Company.

Lost and Found

LOST—Lady's badge No. 5105. If found, please return to the *Railway Age* booth.

LOST—Plain gold lingerie pin, between Hotel Traymore and Dixon booth on pier. Finder will kindly return to F. W. Cohen, Metal and Thermit Corporation.

LOST—Gold mesh purse by Miss Louise Guldman. If found, please return to Royal Palace.

LOST—Badge No. 2591. If found, please return to *Railway Age* booth.

LOST—A diamond and platinum bar pin on Saturday evening by Miss Raster, at the enrollment booth.

LOST—Two return tickets to Baltimore by A. F. Jenkins, Ambassador Hotel, Room 926.

LOST—Railroad badge No. 238. Please return to J. H. Milton, of the Chicago, Rock Island & Pacific.

FOUND—Five-point star and circle enameled pin. Apply to Secretary Conway, Million Dollar Pier.

LOST—R. S. M. A. badge No. 3165. Return to enrollment booth.

FOUND—Lady's blue stone pin, set in filagree silver. Apply to Secretary Conway.

LOST—Badge No. 2747. If found, please call at the *Railway Age* booth.

McBarmma Golf Tournament and Dinner

THE ANNUAL TOURNAMENT AND DINNER of the McBarmma Golf Club were held at the Seaview Club on Saturday. N. M. Garland won the championship medal with low gross of 84. He also won the Sargent Luck cup with a selected score of 77. C. F. Street won the club handicap cup with a net score of 82. Other winners in the tournament were:

Class A, first, A. H. Sisson; second, C. L. Bardo and H. A. Gillis tied.

Class B, first, F. H. Clark, George Bishop and C. F. Street tied, and Mr. Street won in the play-off; second, W. O. Wood.

Class C, first, J. T. Carroll; second, D. R. MacBain.

Guest prizes, first, H. C. Manchester; second, Alfred Calkins.

The following officers were elected: President, C. L. Bardo; vice president, E. W. Van Houten; secretary-treasurer, C. F. Street; directors, B. F. Flory and W. L. Conwell.

The following new members were elected: J. H. Young, E. H. Walker, H. C. Manchester and Samuel O. Dunn.

Election of Mechanical Section Officers

THE ELECTION OF OFFICERS for the American Railroad Association, Section III, Mechanical, was held on Saturday morning.

W. J. Tollerton, general mechanical superintendent, Chicago, Rock Island & Pacific, was elected chairman, and James Coleman, superintendent car department, Grand Trunk Railway, vice-chairman. These officers will serve for the next two years.

For members of the General Committee, term expiring June, 1921: C. F. Giles, Louisville & Nashville; T. H. Goodnow, Chicago & Northwestern; J. T. Wallis, Pennsylvania Lines; W. H. Winterrowd, Canadian Pacific; term expiring June, 1920: C. E. Fuller, Union Pacific; John R. Gould, Chesapeake & Ohio; John S. Lentz, Lehigh Valley; Samuel Lynn, Pittsburgh & Lake Erie, A. P. Prendergast, Texas & Pacific, St. Louis, Southwestern, International & Great Northern; J. W. Small, mechanical assistant to the regional director, Atlanta, Ga.; H. R. Warnock, Chicago, Milwaukee & St. Paul.

For members of the Committee on Nominations: F. W. Brazier, New York Central Lines; H. T. Bentley, Chicago & Northwestern; J. T. Willis, Pennsylvania Lines; D. R. MacBain, New York Central Lines, and J. J. Hennessey, Chicago, Milwaukee & St. Paul.

Industrial Car Manufacturers' Institute

THE INDUSTRIAL CAR MANUFACTHRERS' INSTITUTE had its regular monthly meeting on last Friday at the Marlborough-Blenheim. The Institute is a new organization of manufacturers of the lighter type cars used for industrial purposes. While the organization is a comparatively new one, it is quite progressive. At the present time there are 22 manufacturers in its membership. The objects of the Institute are to bring about co-operation of business methods and the standardization of equipment; special attention is also being given to welfare work and to the improvement of labor conditions.

Colonel James Milliken of the Corps of Engineers, was elected president of the Institute and assumed charge on May 1. It will be recalled that Colonel Milliken, who has been a member of both the M. C. B. and the M. M. Associations for a number of years, was, prior to the taking up of war duties at Washington, superintendent of motive power of the Pennsylvania Railroad at Wilmington, Del. Soon after the outbreak of the war he was called to Washington as mechanical aide to the director general of military railways, where he had charge of the design, purchase and production of the mechanical appliances for use by the American Expeditionary Forces. In the summer of 1918 he was commissioned a Colonel of Engineers and placed in direct charge of the design, purchase and production of all railway equipment, appliances and supplies. This position he occupied until he received his discharge the latter part of April, 1919.

Frank McManamy Honored

AS A TRIBUTE to Frank McManamy, assistant director, Division of Operation, his associates gave him a banquet in the Forest Room of the Marlborough-Blenheim on Saturday night. He was presented with one of only fifty-six Webb C. Ball watches, which passed the test of the United States Government Bureau of Standards. Inscribed in the back of the case are these words: "Presented to Frank McManamy, assistant director, Division of Operation, U. S. R. R. A., by his associates, in memory of his services rendered in connection with the winning of the world war. June 21, 1919."

The guests included Mr. and Mrs. Frank McManamy, W. T. Tyler, director of operation, and Mrs. Tyler; George N. DeGuire, general supervisor of equipment; Fred P. Pfahler, chief mechanical engineer, and Mrs. Pfahler; J. J. Tatum, general supervisor car repairs, and the Misses Lucille and Veronica Ermatinger, nieces of Mrs. Tyler, as well as the following supervisors and assistant supervisors of equipment, several of whom were accompanied by their wives: J. G. Adair, Harvey Boltwood, J. Frank Brady, Mr. and Mrs. R. Campbell, Mr. and Mrs. J. H. Cooper, G. E. Dougherty, Mr. and Mrs. George Dugdale, George Ermatinger, Mr. and Mrs. Hiram K. Green, Mr. and Mrs. John Kane, Mr. and Mrs. William Martin, G. B. Moir, Mr. and Mrs. C. R. Woods and Mr. and Mrs. C. Woodworth and daughter.

R. S. M. A. Annual Meeting

A LARGER NUMBER of members than usual attended the annual meeting of the Railway Supply Manufacturers' Association in the Hippodrome on the Million Dollar Pier Saturday morning at 11 o'clock. All attendance records are nowadays being broken and it was therefore not surprising that the gathering Saturday morning was a large one.

President E. H. Walker occupied the chair. Although he reported verbally for the Executive Committee his statement of the activities of the association since the last convention in 1916 was very complete, and was listened to with interest and approval. The present convention and exhibit was, he said, by far the best and largest ever held. Keen interest was aroused when he told of the visit of seventeen of a total of twenty members of the Executive Committee of the American Railroad Association to the meeting of Section III, Mechanical A. R. A., on the pier Friday and of the interest of these men in the splendid exhibit of railway appliances. Mr. Walker did not use the word, but he plainly conveyed the idea of a great "awakening" among the railroad executives of the entire country in connection with the Atlantic City activities this year.

In the way of routine business the association passed a resolution increasing the amount to be retained in the association treasury from $5,000 to $10,000. It was also resolved that hereafter the fifth association district be composed of the State of Illinois alone and that the other States heretofore included in the fifth district be added to the seventh district.

District elections for the Executive Committee were reported as follows:

Third—W. H. S. Bateman, Champion Rivet Company, Philadelphia, Pa. (Mr. Bateman also represents the Parkersburg Iron Company), and John M. Gillespie, Lockhart Iron and Steel Company, Pittsburgh, Pa.

Fourth—Charles D. Jenks, Damascus Brake Beam Company, Cleveland, Ohio.

Fifth—L. S. Wright, National Malleable Castings Company, Chicago.

Sixth—Col. George L. Morton, Galena-Signal Oil Company, Atlanta, Ga.

The duties of the new members of the executive committee become effective September 1, 1919.

The election of officers for the coming year resulted as follows:

President, George R. Carr, vice-president of the Dearborn Chemical Company, Chicago.

Vice-President, J. F. Schurch, vice-president T. H. Symington Company, Chicago.

Mr. Carr, the newly-elected president, was compelled to leave on an important business trip to San Francisco just after the meeting.

W. T. Tyler Addresses Mechanical Convention

Director of Operation of Railroad Adminstration Praises Sessions and Exhibit as "Post Graduate Railroad Course"

W. T. Tyler, Director of Operation of the United States Railroad Administration, attended the session of the Mechanical Convention on the Pier, Saturday morning and delivered a brief, but interesting address. In the course of his remarks he referred to the achievements of the railroads in helping win the war; praised the work done by the mechanical officers and paid high tribute to the educational value of the exhibit on the Pier. He declared he would use his influence to get the American Railroad Association to hold its spring meeting in Atlantic City next year to enable the operating executives attending it to see the exhibit.

Mr. Tyler was introduced by C. E. Chambers, Chairman of the Mechanical section. He said in part:

I am here this morning as director of the Division of Operation of the Railroad Administration. The other day I called as a member of the Executive Committee of the Railway Association. I am not here with a speech or an address.

I presume a great many were too busy to keep up with all of the war activities of the railroads, and it may be of interest to you to know how many times the railroads actually won the war. That was, at times, a daily occurrence, and other times it did not occur more than two or three times a week; but whenever any fellow had anything he wanted done by the railroads, the outcome of the war depended on the railroads being able to do that one thing. Seriously, I am of the opinion that the railroads of this country did as much to win the war as any other agency. The war produced three or four millions of soldiers in this country in an incredibly short time. That same thing applies to railroad soldiers. It was necessary for almost every man in the service, especially the officers, to entirely change his methods and readjust himself to an entirely new situation.

There were many misgivings about the mechanical preparedness of the railroads to meet the demands of the war. Unfortunately, the railroads did come into the thing in bad condition, because they were laboring under the disadvantage of inadequate rates for several years, and matters had reached a point where many of the railroads were practically bankrupt. There was unpreparedness in the number and condition of locomotives and cars. There had been the most remarkable increase of business during the year 1916 and the first half of 1917, and locomotives and cars were run to their utmost. There was not the time, the labor, nor the facilities, and there was not the money with which to repair them.

Many predicted that it would not be possible for the railroads to meet the burden that would be thrown upon them. But the situation did straighten itself out, and the only way in which it could have happened was through the soldierly qualities of the members of the mechanical organizations. They simply got together and met that situation.

War Achievements of the Railroads

C. R. Gray, in an address at St. Louis recently, touched briefly on one of the special features of our work that stands out in my mind. On February 8, 1918, three Cabinet officers, supported by Mr. Hoover, Dr. Garfield and Mr. Hurley, walked into Mr. Gray's office and laid on his desk a cablegram to the President of the United States, signed by the Premiers of England, France and Italy, serving notice upon him that unless the United States immediately brought its food program for the Allied armies up to par and kept it there, the Allied armies would have to discontinue fighting and withdraw from the field.

It was a notice, putting upon this country the whole burden, the whole responsibility for winning the war, and characteristic of the great American game called "passing the buck," it was brought over to the Railroad Administration with a brief speech from each of the gentlemen present, each one assuring Mr. Gray that his department of the government was ready to meet the situation and it was up to the Railroad Administration to bring the foodstuffs down to tidewater and they would take it across.

Drastic measures were taken immediately to meet the situation. Mr. Hoover said "it is out there"—he said it covered the country—but he could not say just where it was.

Dr. Garfield assured us that the coal was already mined, and the miners were waiting to put it into the cars if we furnished the cars.

Mr. Hurley assured us that the ships were all on the ocean, and that they would be in port whenever we had food there.

An order was issued taking equipment away from the Eastern section of the country, regardless of the freight offering for movement. Cars were taken out of the industries empty, when the shippers had the freight piled up on their platforms ready to put into the cars. In about two weeks Mr. Gray was able to send a letter to the French High Commission, and to Sir Cunnifs Guthrie, the British representative in charge of the purchases for the Allies, and to each of the gentlemen who had visited him that morning, that the principal ports of commerce were at that time practically blocked with food supplies in cars waiting for ships, and while he would very much regret to do so, unless relief were offered at once, he would find it necessary to issue an embargo. From that moment on the shoe was on the other foot all the time. The movement of food supplies into the ports had to be regulated to meet the arrival of ships which could transport the food overseas.

Right along, almost every few days, we had some delegation come to see us who stated that their industry would perish if not supplied with cars. I recall that a great many cars had to be taken out of the Southeast, where the big bulk of fertilizer is manufactured. We had a call in a few days from members of the Association of Manufacturers of Fertilizer, with a representative from the Department of Agriculture. They assured Mr. Gray unless cars were furnished immediately, and in preference, for the movement of fertilizers, that there would be no crops in this country in the Fall of 1918, that a great majority of the farmers of the country depended upon fertilizer for their crops, and that at that time they were so far behind in its movement that it would be almost impossible to catch up and meet the situation, but that if we would turn over to the fertilizer industry the exclusive use of the cars and railroad facilities for the period of about thirty days, they might possibly save the situation.

Then came Mr. Hoover again to say that about 90 per cent of the total corn crop of the United States for the previous season was still unmoved—it was largely

on the farms—that about 80 per cent of that total was soft corn, and that it would germinate in the month of March and be a total loss. It was not cured, and unless it could be moved in the drying elevators and cured, and gotten out of the way, it would be a total loss, and we would starve to death, because all of our wheat had to go to the armies abroad. That situation did, in fact, exist, but it was met. By that time the overseas food situation had been met, and we were able then to turn the cars into the movement of corn.

In about six weeks there was more corn moved to primary markets, dried and moved out to its ultimate destination than had ever been moved in six months in the United States before. I do not know how it was accomplished—it was accomplished by the men on the job, that's all; they were told what was necessary to be done, and did it.

Following that came the men who built silos. They explained that for about two years they had not been able to carry on the work of building and distributing silos throughout the country, and that there had been a tremendous loss the year before in foodstuffs as the result of not having silos to take care of the corn crop, which was destroyed in the field, and there was greater danger last year than ever before of that happening again, and unless they could be furnished with cars we would all starve to death.

Then came the tin can manufacturers. They said even if we were at that time to give them absolute preference to the use of the railroad facilities of this country, in the movement of tin to their plants, and the movement of the manufactured product out to the distributing centers, they would not be able to meet the situation. They said they were so many hundreds of millions of cans behind, it was impossible to meet the situation, and a great deal of food would go to waste because of their not having cans in which to preserve it, and we would starve to death. That thing followed right along. Every fellow came in with his particular product and proved to us, unless he was given preference, the whole thing would go to smash.

Now, you men out on the job, met that situation, and as I say, you saved the country every time you did it. Each and every situation that I have mentioned, and many more which the railroads had to meet, they did meet. In doing so, I feel that we produced as good soldiers in the railroad operation as were produced in the Army. Speaking once again for the mechanical organization, as I saw it from Washington, while the Army produced wonderful soldiers, and the Navy produced wonderful sailors, our organization was absolutely amphibious—we worked above or below water, and it did not make any difference.

Praise for the Convention and Exhibit

Now, just a word about the Convention, and our experience here this time. I do not know of any department of the service that has labored under greater disadvantages than the mechanical men. The building of a roundhouse comes only after you have supplied the wants of all of the other departments on a railroad. You are expected to get along out-of-doors; you are expected to get along in any kind of weather, and if you do not do it, you are simply inefficient, that's all. This is my first experience at one of these mechanical exhibits, and I want to say here and now, and say it for publication, that I regard the mechanical exhibit here as a post-graduate course for mechanical officers that is not available in any other way. The doctor, for instance, takes his post-graduate course every year or two, in order to keep up with the times. You gentlemen have great need for the same post-graduate course, frequently, and nowhere else is it available as it is right here on this Pier, and I am going to use my personal effort as a member of the Executive Committee of the American Railroad Association, to bring the spring meeting of that Association here to Atlantic City while you are in session. (Applause.) I think it will be just as helpful to the Executive officers of the railroads of this country, as it will be to you, and it will give them an entirely new conception of what you accomplish here, and of the opportunities that are put into your hands for, as I say, getting a post-graduate course in mechanics.

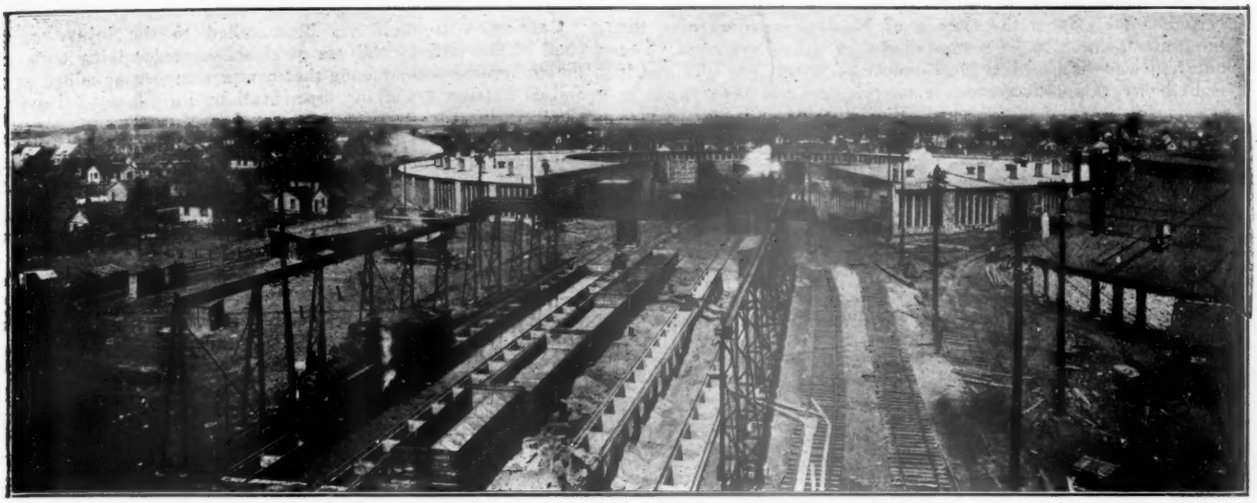
I think it will be helpful to you, in that it will enable you to demonstrate to the executives and the chief operating officials of the road what you can do if you are given up-to-date machinery and up-to-date tools; in fact, as you all know, there is a great difference between going on with what you have been able to utilize in order to keep your machinery in operation, and in going on with what is up to date and what really meets your need in handling the heavier power, and heavier cars, and heavier traffic which moves over the road.

I think a great deal of good will come from the visit of the Regional Directors and members of the Executive Committee of the American Railroad Association to this convention and the exhibit. If I had realized the importance of it a little earlier, I would have endeavored to have had the spring meeting at this time to cover two or three days, so as to have had them all here for several days; but some of them had important engagements and they hurried away after finishing the work in one day. Two or three of the gentlemen have remained over, and every one has voiced himself as anxious to come back, and as having an entirely new conception of these meetings and of this railway supply exhibit.

Now, I want to say in that connection, that as the result of the variety of interests of the different railroads and of business competition, it has been difficult in the past for you gentlemen to get over some of the things that you have recommended, to secure approval of many of the standards that you have recommended, and that you have seen the need of. The life of the United States Railroad Administration, we are told, is limited now to the close of this year, and I want to ask, therefore, that while the opportunity is ripe, you bring as many of these things to the attention of the Railroad Administration as you can, through Mr. McManamy, and let us work them out at this time, and get them into effect, and perhaps they will last after the roads go back to the individual owners. I pledge you my own personal assistance in this matter, and I want you to think seriously of taking advantage of the opportunity that we have. We can perhaps accomplish some things now that you gentlemen have had in your minds for a long time, but could not get all of the interests together on. Now, while we have that opportunity, let us go along with it. I will help you.

Plans for 1920 Air Brake Convention

THE AIR BRAKE ASSOCIATION and the Air Brake Appliance Association held a joint meeting in the Marlborough-Blenheim on Friday, F. J. Barry presiding. Plans were formulated for the exhibits in connection with the next convention, which has been set for May 5, 6 and 7, 1920. Chicago was chosen as the place of meeting. Twenty-two new applications for membership in the Appliance Association were acted on and arrangements were made for the assignment of exhibit space.



Chicago & Alton Engine Terminal at Bloomington, Ill.

American Railroad Association, Section III, Mechanical

Proceedings for Saturday Morning, Including the Tank Car Report which was Presented Friday.

THE SATURDAY MORNING SESSION of the American Railroad Association, Section III, Mechanical, was called to order at 9.40, Chairman Chambers presiding. The session on Saturday was an innovation, as compared to previous conventions, but there was a large attendance and the arrangement proved satisfactory. The report of the Committee on Tank Cars, which was presented on Friday, was not published in Saturday morning's *Daily* and follows herewith:

Report of the Committee on Tank Cars

WITH THE WAR CAME the necessity for the transportation of various products, among them toxic liquids for filling shells, not previously handled in tank cars. The Class III car was adapted to this service by the modification of certain details, such as omitting all openings in the shell, making the dome capacity about one per cent, special arrangement for closing the dome opening, etc. Another demand was for tank cars for carrying compressed liquefied gases, notably chlorine. The specification for Class V car, with welded tanks, adopted by the association in 1917, with some modifications of details, met the situation very well.

Some difficulties were experienced in welding anchorages to the tanks. This was remedied by avoiding the use of anchorages having great length of welded contact with the shell.

The seams of these tanks were hammer welded throughout, using water gas as the heating medium. With steel of a proper quality there seems to be no difficulty in securing throughly sound welds and containers which are bottle tight. The American Society for Testing Materials has prepared a specification for "Plates for Forge Welding," which meets the views of those engaged in producing welded containers. If this specification is adopted by the A. S. T. M. this year, the committee recommends that it be substituted for the specification of the A. S. T. M. for Boiler Plate Steel, Fire Box Quality, now prescribed by the Tank Car Specifications for tanks of Class V cars. To insure getting satisfactory material under this latter specification it has been necessary for the users to make certain restrictions within its limits.

Suspensions of Requirements.—As stated in the committee's report last year, the necessity of keeping in service every car capable of safely handling liquid products made it advisable to suspend until July 1, 1919, the requirements of flange quality steel for Class III tanks, and until January 1, 1920, the hydraulic retests of tanks of Classes I, II, III, IV and V cars. As the conditions which led to these suspensions have passed, your committee has recommended to the Executive Committee that no further extensions of these requirements be granted and that circulars be issued to inform all interested accordingly.

The Notes of Section 2 (a), Material, Class III Specification, and Section 23, Tests of Tanks, Classes I, II, III, IV and V Specifications, covering these suspensions should be omitted.

The notes to Section 2 (a), Material, Class III Specification, portant matters, the committee has been able to make but little progress during the past year with the experimental work in connection with the safety valve. For use in connection with these tests better springs than are ordinarily used in these valves have been purchased but even these do not entirely comply with the specifications.

It is very evident that for certain products it will be necessary to provide a safety valve in which corrosion is guarded against by the use of non-corrosive material in both the housing seat and the bearing face of the valve proper.

The committee has made some experiments in electrically welding the non-corrosive metal to the iron parts, but the results so far have not been satisfactory. Further work will be done in this direction.

It is not certain that an absolutely tight valve can be secured which will at the same time retain the valuable feature of the present design, viz., very free discharge in case of necessity. A considerable amount of information has been accumulated concerning the behavoir of safety valves under pressure, and the committee hopes to be able to push the work to a conclusion during the coming year.

Safety Valve Collar, Fig. 10-A.—Complaint has been made that with the rivet circle of 5⅛-in. radius the hub of the collar interferes with the rivet set. The size of this collar is limited by its location on the dome head, and the committee does not believe that there will be any question of safe construction if the radius of the rivet circle and the radius of the outside of the collar are left to the car builder, and therefore recommends that these dimensions be omitted from Fig. 10-A.

Bottom Discharge Valve.—Complaints continue to be re-

ceived, notably from the Bureau of Explosives, concerning the unsatisfactoriness of the bottom discharge valves now used. The question was discussed in the committees' report for 1917 and it is to be regretted that little or no progress has been made in the improvement of this feature. Reliance against leakage seems to be really placed on the cap of the discharge pipe instead of on the valve and although the regulations prescribed by the Interstate Commerce Commission require that cars shall be loaded with the caps off, it is apparently the general practice for loading to be done with the caps on, primarily for the reason that the valves are not tight, and the only way to prevent leakage during the process of loading is to rely upon the cap. The breaking of the cap in derailments and from other causes frequently results in the partial or entire loss of the contents of the tank, and too often in fires.

The committee does not feel that it would be proper for it to undertake the design of this part and then recommend it as a standard, and trusts that a design may be developed by the tank car builders or users which will be enough better than the present ones to warrant its adoption. The committee believes that the present conditions of the tank car traffic require some form of bottom outlet.

Riveting.—Criticisms have been received that tanks with 5/8-in. rivets, particularly those tanks having 7/16-in bottom plates, 5/16-in. shell plates, and 1/2-in. heads, have given trouble from leakage because of the small size of the rivet head. While the committee believes that such cases are due rather to bad workmanship than to any mistake in the size and spacing of the rivets, it has made a canvass of the car builders and finds that a number of them, considering the fact that the circumferential seams have a surplus of strength, prefer the use of the 3/4-in rivet with sheets 5/16-in. thick and over, and show that with a spacing of 2 3/4 in. they can still maintain the required 70 per cent strength of seam. In the head seams it is undesirable to use different sizes and spacing of rivet holes where the different thicknesses of bottom and shell sheets are joined to the head.

The committee recommends that for Classes III and IV cars the use of 3/4-in. rivets with 2 3/4-in. spacing be permitted with 5/16-in. plates. The committee is not prepared to recommend a wider spacing.

Section 3 (b). Riveting, amended in this respect, would read:

Thickness of Plate.	Diameter of Rivet.	Longitudinal Pitch.	Back Pitch.
5/16 in.	{ 5/8 in.	2 1/2 to 2 3/4 in.	1 1/2 to 1 3/4 in.
	{ *3/4 in.	See Note.	

* Note.—For longitudinal seams with 3/4-in. rivets, 2 3/4-in. longitudinal pitch is necessary to insure 70 per cent strength of seam.

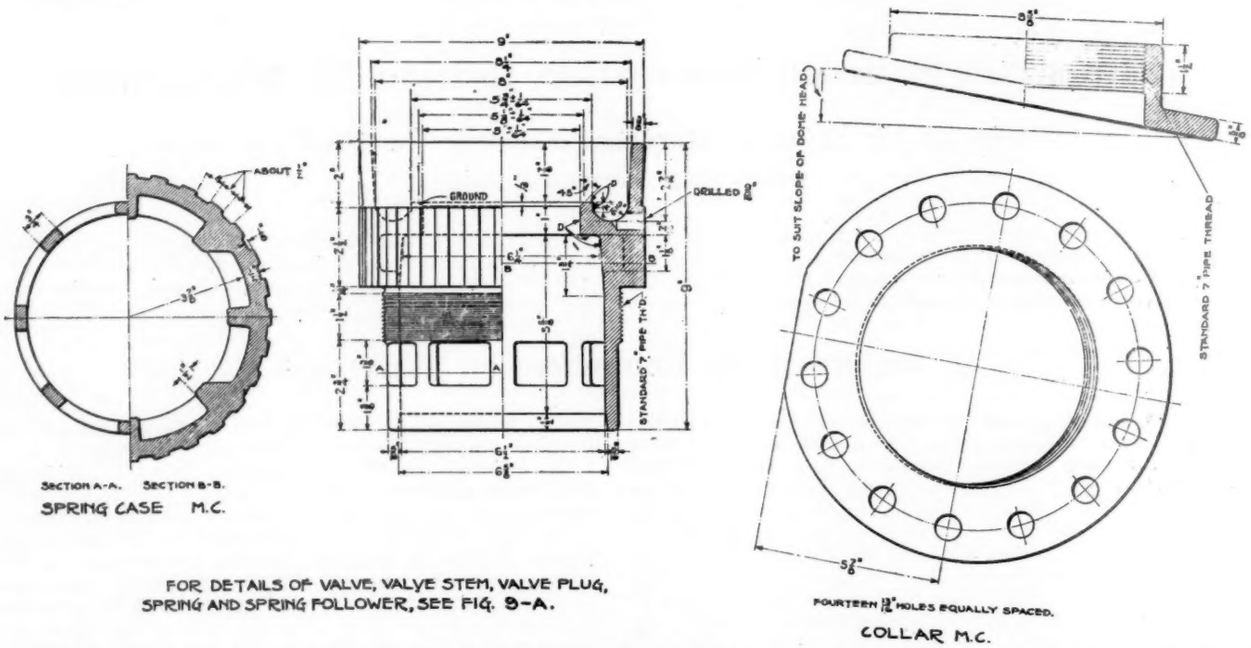
Calking.—Attention has been called to the injury of the shell of the tank by the use of chisel-pointed calking tools, and the committee recommends that a new sentence be added at the end of Section 4, Calking, Specifications for Classes III and IV Cars, reading,

"Split calking shall not be permitted."

Application of Running-Board Brackes on Tanks Covered with Jackets.—It is recommended that in paragraph "Manner of Application of Safety Appliances" the sentence, "The running-board brackets must be attached preferably to the underframe, or to metal pads attached to the shell proper," be changed to read: "Running-board brackets must be attached to the underframe."

Application of Dome Platform Brackets to Tank Cars Covered with Jackets.—It is recommended that in the paragraph "Manner of Application of Safety Appliances," the words "on the outside of the jacket" be omitted from the third sentence, so that it will read, "Dome platform brackets must be attached to suitable bands."

Inspection.—Section 25 of Specifications for Classes I and II cars has a note which seems to conflict with Interchange Rule 3 (e) and the committee now recommends that it be omitted from the two specifications.



Revised 1918: Spring seat and opening for valve to be dressed. Tolerance limits fixed for certain dimensions of valve seat. Thickness of bottom of spring case changed from 3/8 in. to 5-16 in. Form of inside ribs of spring case changed.

Fig. 10a.—Details of 5-in. Standard Safety Valve, Applied to Dome

Boards for Attaching Placards Prescribed by the Interstate Commerce Commission.—It is recommended that a new section be inserted in the Specifications for Classes III, IV and V Cars, reading: "18-A. Cars shall be equipped with suitable boards for attaching placards prescribed by the Interstate Commerce Commission. These boards shall be of sufficient size to permit placards to be applied with the opposite points of the diamond in vertical and horizontal positions respectively."

Some minor corrections which were overlooked in the 1918 Revision should be made as follows:

Method of Testing Safety Valve in Place on Car.—In the Table of Scale Readings, 25-lb. setting the minimum scale reading sould be 430 and the maximum 550, the same as shown in Fig. 13. The reference to tolerance sould be changed to agree with the 3-lb. tolerance for the 25-lb. setting, as follows: "The minimum and maximum scale readings are the limits within which the valve must open when being tested to come within the tolerance of 1 lb. for the 12-lb. setting and 3 lb. for the 25-lb. setting, above or below the normal pressure per square inch at which the valve is supposed to open."

United States Railroad Administration Tank Cars.—Under date of February 7, 1919, the secretary, by direction of the

Executive Committee, referred to the Tank Car Committee the suggestion that they go over the plans and specifications for the United States Railroad Administration Tank Cars (Oil Cars, 7000, 8000, and 10,000 gal. capacity, and Acid Cars of same capacities), and consider the advisability of adopting them as standards of the Master Car Builders' Association, report to be made at the coming convention.

This involves two questions: 1. As to the wisdom of adopting any particular tank car designs as M. C. B. Standards. 2. Whether from all standpoints the government tank car designs meet the requirements of the tank car traffic better than others now being followed. In deciding these questions the interests of the railroads, the tank car owners, and the car builders must be considered..

The committee believes that as long as the requirements of the Master Car Builders' Standard Specifications covering the essential features of tank car construction are complied with it would be unwise to restrict the builders and users to certain standard designs, as the many commodities of widely different characteristics, weights and values transported in such cars require for their safe and economic handling various modifications in detail design.

The Railroad Administration designs were prepared to meet the M. C. B. Specifications, and this committee passed them in conference with the Railroad Administration. The tank car equipment of the country, in which the railroad ownership is comparatively small, must also be assumed to comply with the M. C. B. requirements, as it is moving in interchange. Specifications and prints have been furnished by the Railroad Administration for its cars, but the time available is entirely too short to permit the proper comparison and consideration of them and of the plans and the specifications for other designs of cars which must be gone over to answer the second question. The committee will be glad to have further instructions in this matter.

The report is signed by: A. W. Gibbs (Chairman), Pennsylvania; C. E. Chambers, United States Railroad Administration; Wm. Schlafge, Erie; Samuel Lynn, Pittsburgh & Lake Erie; John Purcell, Atchison, Topeka & Santa Fe; O. J. Parks, General American Tank Car Corporation and A. E. Smith, Union Tank Line.

Discussion

Mr. Gibbs: On page seven recommendations are made to suspend the requirements, and among those you will remember that during the course of the war we recommended the allowance to use tank steel instead of the specification boiler steel. A great many cars have been built according to those specifications, and a number of railroads and some builders have material to build cars which are on order. I would like to withdraw that part of the specification to suspend entirely until July 1, 1919, the requirement of flange quality of steel for Class III tanks, but have left it to the Executive Committee to fix a date after our committee can get all the facts.

There is a paragraph on bottom discharge valves, which I need not read, because I have a separate paper, and Colonel Dunn will also speak on that subject.

In regard to riveting, your committee is in doubt as to how much of this is based on poor workmanship, and how much is real necessity. We recommend that it be permissible to increase the size of rivets from 5/8 in. to 3/4 in.

At the time the report on Hand Brake Power was written the Executive Committee had not adopted rules for any practice on tank cars. Since this was written they have done so, and the Committee on Train Brakes has issued a diagram and circular. We recommend that this be made part of the report.

The Bottom Outlet Valve on Tank Cars

Individual Discussion by A. W. Gibbs

THE following discussion is to be undertsood as an expression of personal views, and does not of necessity express those of the members of the Tank Car Committee.

The bottom discharge valve on tank cars antedates the formation of the committee in 1903. Its use was due to its manifest convenience in discharging the contents of such cars without the aid of any auxiliary machinery. In detail, it consists in nearly every care of a miter valve, fitting into a conical seat. The valve is guided by either a pin passing through a hole in a bridge below the seat, or wings fitting a cylindrical hole forming the discharge passage below the seat. The material may be either steel or cast or malleable iron, the seat usually being cast or malleable iron. In practically all cases the valve discharges into a vertical cast iron pipe having a flange riveted to the shell of the tank. The seat for the valve is machined in this pipe casting. At its bottom end the pipe is ordinarily closed by a screw cap with internal threads corresponding to those of the union of the pipe leading to the storage tank.

The valve is as a rule operated by a certical rod socketed and pinned to the valve and extending up into the dome where it is guided by a suitable bracket. This bracket also serves as a support for a lifting cam or some form of nut engaging a threaded portion of the rod. Where the lifting cam is used a spring below the bracket engages a collar on the rod and is supposed to keep the valve firmly on its seat. Other variants of this arrangement have been used, such as a yoke and nut immediately above the yoke, but not, so far as we are advised, combined with the yoke and spring. While this arrangement has possible advantages, it has also the disadvantage that the whole assembly is submerged and very inaccessible in the event that anything goes wrong.

There has been a great deal of complaint of the whole bottom discharge arrangement, and it is probably the main source of leakage of tank cars. The Tank Car Committee is in receipt of numerous complaints from the Bureau of Explosives, relating to cases where tank cars have lost all or a part of their contents by leakage at the bottom discharge valve. The indication is that shippers rely mainly on the bottom cap to prevent leakage. Complaints from other sources have supplemented those from the bureau. A number of bad cases have been due to water leaking past the valve into the discharge pipe and subsequently freezing and bursting the discharge pipe and unseating the valve. Still others have resulted from the exposed end of the discharge pipe being struck and broken, unseating the valve at the same time. The modern anchorages almost insure against the cases where the discharge pipe is broken by the tank shifting.

The question naturally arises, why should there be any difficulty in securing a thoroughly tight valve where the pressure is so very low—usually only that due to the static height of the liquid? At first thought it seems to be the simplest kind of a mechanical problem. This may be the reason why no serious attention appears to have been given to making a radical improvement. It is difficult to see where there has been any betterment in this feature of the car during the life of the Tank Car Committee.

In seeking for the causes of leakage we suggest the following possibilities: 1. Corrosion of the valve or seat. 2. Lodgment of dirt or trash on the valve seat. 3. Cocking of the valve from insufficient guide or from improper fitting of the lifting socket. 4. Displacement of the valve from surging action of the liquid contents of the tank. 5. Change of shape of the tank due to the weight of the lading causing lateral spreading with resulting decrease of vertical height.

The first of these sources of leakage is easily remedid by the use of non-corrosive material in the valve and its seat. As the seat is usually formed in the top end of the discharge pipe it will be desirable to roll or pean a ring of non-corrosive material into a proper seating in an undercut groove in the pipe, so as to reduce to a minimum the amount of stealable material. The same care would have to be taken in pre-

paring the valve itself. In this connection it should be mentioned that the seats must be adapted to the nature of the products handled.

It may be desirable to so arrange the valve and its guide and the valve seat that the whole assembly can be readily removed from below. This will insure better workmanship in refitting, as the work can be done under very much more satisfactory conditions than with the present arrangement where the men have to go into the tanks. In the case of cars carrying inflammables the tanks have to be steamed out before the men can enter. Such an arrangement would probably require a larger discharge pipe, which does not seem to be particularly objectionable.

The lodgment of dirt or trash on the valve seat probably occurs during the drainage of the last portion of the contents of the tank. The only practical remedy that we can suggest is care at the loading rack, passing the contents through a proper screen.

I believe there is a great chance of improvement by the use of some form of rotating valve in which the valve and seat are always in contact, the liquid contents discharging through ports which register when in the open position. The main disadvantage of this arrangement is the size of the opening required to provide the necessary area of discharge ports. I believe that the rate of discharge, especially during the latter stages, can be much increased by the use of proper overhead shields which will prevent the access of air through eddy action of the outflowing liquid.

Cocking of the valve is believed to be a potent cause of leakage. It should be borne in mind that a conical seated valve fits its seat only when the axes coincide; any but right sections of such a valve are ellipses. Spherical seats are free from this objection, but are so much more difficult to maintain that they are not to be recommended. The causes of cocking are many, such as rigidly pinning the valve to the operating rod, poor workmanship in providing proper guides above or below. I believe that an overhead cylindrical guide, such as that of the cup-shaped valve used in the old-time crosshead feed pump, has great possibilities.

The displacement of the operating rod by the surging of the liquid contents of the tank is offered as a possible source of valve leakage. With some of the large tanks having much less than the required percentage of dome capacity, which in consequence must not be loaded shell full, the rod is continually subject to this action, especially with viscid liquids. Enclosure of the rod in a protecting pipe would guard against this action.

Deformation of the tank from the weight of the contents is known to occur. We have some data concerning the flattening which occurs at the loading rack, but none as to that which occurs in transit due to uneven track. Where the valve is cam operated with spring take up it is not quite clear that this action should cause the valve to chatter on its seat.

Finally, there is the failure to properly close the existing valves, for which we have no remedy to suggest other than to make the open and closed postion of the openating handle so plain as to be reasonably foolproof.

The Chief Inspector of the Bureau of Explosives has suggested that the Tank Car Committee design a proper outlet valve arrangement, but we have felt that it is not advisable for the committee to devise such an arrangement and then push its adoption. We believe that there is ample talent among the engineers of the car building and car operating companies to provide adequate devices if they will give this feature the same attention that has been given to the improvement of the general construction of the tank car.

Discussion

Mr. Gibbs: Our committee has been in constant receipt of complaints from the Bureau of Explosives of loss due to continued leaking at the bottom discharge valve. The designers have made little or no progress over a long period of time, and this report is written with the hope that those who are designing cars will submit designs which give some promise of being tight.

Colonel Dunn is present and I would suggest that he be given the privilege of the floor, to tell us just how bad the trouble is.

Chairman: I will be very glad for the convention to have Colonel Dunn address us.

Colonel Dunn Speaks

I am very glad for an opportunity to talk to you gentlemen on the subject of tank cars. You all know that the Interstate Commerce Commission has issued regulations intended to safeguard the transportation of explosives and other dangerous articles; that a part of those regulations has been to prescribe the specifications governing the manufacture or shipping and the containers for dangerous articles. A single exception to that practice was made in the case of tank cars. When these regulations were promulgated, this Association through its tank car committee had charge of prescribing specifications for tank cars, and it was thought best to leave the matter in the hands of that committee.

There are three things about the tank car which are weak. They are the bottom discharge valve, the safety valve and the dome cover. The people who are responsible for designing and constructing the tank car, to make it an efficient shipping container, have borne for about 20 years a responsibility of getting these parts of the tank car right.

The most destructive article, from the railway standpoint, that we have to transport to-day, is gasoline. Some years ago, when the Bureau of Explosives was organized, every one thought it was dynamite and similar explosives. Let me read you a few figures that come from our reports.

In the period of 1910 to 1917 the number of people killed on the railroads in the transportation of dangerous articles of all kinds, not including explosives, was 97—78 of those people, or over 80 per cent, were killed by gasoline; 901 people were injured; 607 of them, or 67 per cent, were injured by gasoline. Only four people were killed by explosives, gasoline being nineteen times as dangerous from that standpoint. Thirty-four people were injured, gasoline being eighteen times as dangerous as explosives. The property loss in those eight years was $3,500,000. Gasoline caused $1,600,000, or 46 per cent. The property loss from explosives, omitting the Black Tom explosion, which was a war outrage and not a transportation accident, was $135,000; to $1,600,000 for gasoline, or gasoline was twelve times as destructive from the standpoint of money as explosives of all kinds.

During 1918 the tank car carrying inflammable liquids, acids and corrosive materials, killed 22 people, injured 56, and caused a money loss of $977,000, or about 1-23 of all the freight losses on the railroad.

The tank car accidents in 1918 summarize as follows: 49 were due to derailment, which killed 12, injured 13, and caused a money loss of $651,000; 37 collisions, killing 2, injuring 9 and causing a loss of $199,000. There were 59 leakages not caused by derailment or collisions, which killed 8, injured 34 and caused a loss of $126,000.

In 1918, if our tank cars had not had bottom valves, we would have saved the lives of 3 people, the injuries of 11 and money loss of $245,000. That does not include very large losses as a result of evaporation from both the bottom valve and the safety valve.

F. J. T. Stewart, Superintendent of the Bureau of Surveys, New York Board of Fire Underwriters, and President of the National Fire Protection Association, in answer to my questions, says: "I first familiarized myself with the present provisions for emptying such car tanks. I am impressed with the objectionable features of the outlet valve, located at the bottom of the tank and having a discharge pipe extending some distance below. This arrangement is a serious violation of a fundamental safeguard which the National Board of Fire Underwriters have stood for for many years. I refer to the prohibition against gravity pressure upon such a valve, which experience has shown is exceedingly difficult to keep tight. On the tank car the danger of derangement of this valve is infinitely greater than in the case of a fixed storage system. The valve being located in the bottom of the tank is affected by the slightest amount of sediment. Water, due to condensation, is also likely to accumulate at this point and freeze in cold weather. The projection of the outlet pipe below the valve offers an additional opportunity for derangement of the valve by being struck in case the car leaves the track. Serious fires have resulted

from this bottom valve, causing losses not only to the tank cars and their contents, but also to adjacent properties."

An extract from a report of one of the inspectors of the Bureau of Explosives indicates the general impression produced upon the mind of a disinterested man who has spent all his life traveling over railroad lines, where very large numbers of tank cars move.

"Aside from the fact that this tank car should not have been in transportation service, because of being in bad order and not complying with the M. C. B. Rules, and the various violations committed by the agent in waybilling the shipment, the contents would not have been lost if the tank had not been equipped with an outlet pipe at the bottom, which broke off when the tank shifted on the frame. The outlet pipe on tank cars is responsible for 95 per cent of the leakage of contents of tank cars, due to the fact that the outlet valve and the fittings on the outlet pipe cannot be made leak proof. In the winter, water will get in the outlet pipe and cause it to freeze and burst and the ice in the pipe will unseat the outlet valve. The only reason that I can see for having tank cars equipped with outlet valves and outlet pipes is for convenience in unloading and that can as well be done from the dome and a five-in. tapered plug can be substituted for the outlet valve."

Similar reports show that that is the general opinion of representatives of the Bureau of Explosives.

In England they do not allow bottom valves in any tank wagon which carries an inflammable liquid. They do not allow the most dangerous inflammable liquids to go into tank wagons at all, and gasoline is one of them.

Another extract from a report of one of our inspectors assigned to tank car work, who has just returned from a trip through the oil region in Oklahoma and Texas, follows:

Of leaky outlet valves, he says:

"This condition was observed on May 9th at Forth Worth, 14th at Burkburnett, 27th at Sapulpa, 28th at Kieffer, and the 29th at Shamrock. Tanks involved were owned by Anderson and Gustafson, General American Tank Car Corporation, Inland Refining Co., M. R. Travis Co., Oklahoma Petroleum Co., Keith Tank Line and Pelican Oil Refining Co.

In addition there must be many which do not show valve trouble because of the practice of using lime in the outlet valve caps. While this has proved to be the best method of insuring against leakage from the cap, it is depended upon too much by those who do not leave the cap off while loading. On several cars on which I saw the caps removed, leakage came from the outlet valves in streams, showing that the cars had been loaded with the caps on and the responsibility of the valve transferred to the cap by the use of lime. Efforts to reduce the leakage by manipulation of the valve rod failed and transfer was necessary.

At isolated tracks, where there is difficulty in securing empty cars, the temptation is strong to try to hold the load with the valve cap if another car is not available.

At Sapulpa, on May 28th, I saw a car loaded with gasoline and bearing on each side a label,

DO NOT REMOVE
BOTTOM OUTLET VALVE
We will not be responsible for
any loss entailed in unloading
from the bottom.
UNLOAD FROM DOME

I think our 20 years' experience in waiting for a satisfactory bottom discharge valve, is about as much time as we ought to wait. My remedy is to do away with it entirely. This suggestion is radical from the standpoint of the owners of these tank cars, and for the shippers who use them. I am not making it with the idea that it will be adopted at once, or that all of these sacrifices that it would entail would be brought at once upon the owners of tank cars. I have asked a number of the larger shippers to give me some data as to what it will mean to them if this bottom valve is taken off, but I have not yet received their replies.

I believe that most large shippers are prepared at their large plants to unload through the dome. If a shipper is large enough to get gasoline in tank car lots, he ought to be large enough to get an equipment to unload through the dome.

The safety valve is second in importance to the bottom discharge valve. It was put on, as you know, to avoid the danger of a rupture of the tank in case of accidents involving fire. I will read what Inspector Grant found in regard to safety valves down in the oil region:

"In the usual trouble from blowing safety valves it was noticed that the temperature raised and interior pressure developed from exposure of the tanks to the sun. I went up on a number of cars where the leakage of gas from valves was heavy and the hissing noise could be heard from the ground at a considerable distance. There were a number with a quiet escape of gas evident only from a wavy appearance in the air about the valves and a very strong odor.

"At Sand Srings, in the shop of the General American Tank Car Corporation, on May 30th, I had Superintendent Eakins conduct some tests with new safety valves of Trumbull make as well as their own. No amount of adjustment or regrinding could make them tight, and they blew under test at practically all pressures up to the popping point.

"At Argentine, May 31st, at the works of Thomas Track Appliance Company, I found that they were machining a wider valve seat than called for in M. C. B. specifications. I arranged to have two complete valves machine to exact dimensions for testing at the shop of the Sinclair Refinery on June 3rd. These tests were conducted in the presence of Master Car Builder Beasley, Shop Superintendent Osborn and Inspector J. M. Scott. It was found impossible to get the valve tight, and the trouble showed itself due to a side lift. I do not believe that the present type of valve will ever prove satisfactory.

"The bottom outlet is not necessary in transportation, and without the development of a type to reduce or prevent the rapidly increasing cases of leakage it seems to me that it would be best to eliminate bottom valves."

He found that they could not make a new valve work in accordance with the specifications. We haven't yet had any big disaster in the storage yards in the oil region, but I am living in trepidation that from day to day I am going to hear from one. What does it mean to shippers to have that constant escape from this loose safety valve? A great many of them get to destination with shortage of contents. The railroads are asked to pay for a great deal of it, and the shippers themselves have to pay the major portion.

It is by no means uncommon to hear of a tank car losing 10 per cent of its products while en route. That is a tremendous tax upon the resources of the country and is due in a large measure to the fact that safety valves on tank cars do not hold; they leak almost from zero pressure.

Most of the dome covers are secured by a screw thread. It is a very large and heavy piece. Many of the men who should secure it after loading a car do not secure it properly, and many of them injured the thread. They are not vapor tight or even water tight. In attempting to screw them down, the gaskets underneath have been punched and inured; the holes that have been drilled to prevent opening the domes under pressure have taken up part of the thread, and the result is that wherever you get a high vapor tension product in a tank car today, you are liable to have the vapor, escaping from under the dome cover

The design, assembled from the interior, which was submitted by the Union Tank Line sometime ago, and I understand approved by your committee, is a very much better one than the screw design that we are using. A large number of accidents have occurred as a result of men attempting to unscrew the dome cover, when there was interior pressure in the car. The usual result is for them to unscrew it until only one or two threads remain, and then the pressure in the car does the rest of it, blowing up the dome cover and a column of liquid with it. The hinged bolts, or the design assembled from the inside, would make it impossible for that accident to occur.

I hope that the owners of tank cars, those who construct them, those who are responsible for their use, will give serious consideration to the troubles that I have detailed and that they will meet us in the right spirit and devise some reasonable way to at least better the condition.

Mr. Gibbs: Before Colonel Dunn leaves the stand, will he tell us whether that great loss through the valves, particularly safety valves, is on cars which are jacketed? We prescribe a special car for handling these casing head gasolines, and my observation is that they are comparatively small in number.

Colonel Dunn: This is from the ordinary tank car. The regulations permitted shipment in an ordinary tank car of casing head gasolines, when they reduce the vapor tension down to 10 lb. All of these shippers claim that they do reduce the vapor tension down to that point; but experience shows that when the sun beats down on one of these tank cars long enough, you will get a vapor pressure that is sufficient to give this trouble, even where it is not a prohibited article. I have heard of very little trouble from those insulated tank cars.

Mr. Harding: I represent a private ownership. We have a number of tank cars that carry explosive products. Colonel Dunn's remarks are very interesting and instructive. I wish he could be a little more helpful in reference to that discharge nozzle. We have followed very carefully the Tank Car Committee's recommendations in past years. In addition to a discharge nozzle there are also two pipes entering into all our tank cars; for instance, through the bottom, for coils. It is necessary to take care of crystallized products, as they must also be removed. Our greatest losses are through the heating coils. The pipes extend from the bottom down each side of the discharge nozzle, and a man swinging himself under the car, grasping that pipe to help himself through, has, at times, broken off the pipe. It is necessary to have a valve on that, and at times that valve has been opened, causing loss.

We find that there are very few people receiving our commodities that are equipped to blow out or syphon or pump out our products. Our dome covers are of cast steel; they are hinged, and are held in place with swining bolts. We ship the highest grade ammonia, and I cannot recall an instance in the past 19 years that we have had losses from leaking dome covers. I don't believe that this convention should put it up to the builders of tank cars, or the operators of tank cars, to find out the best means. I believe it remains for the Tank Car Committee to tell tank car users what to use, just the same as you are telling all other people what to do, and properly so.

Chairman: Evidently you don't think we would have any controversy if the Tank Car Committee did all of these things.

Mr. Harding: Yes, but the controversy would have the authority back of it at any time.

Chairman: It would have to be approved by the Tank Car Committee. I am sure we are very thankful to Colonel Dunn for his talk to us. He is always helpful, no matter where or when.

Now, the Report of the Committee is before you gentlemen. It has really only one specific request, and that is that the paragraph about the time limit of the use of flanged steel, whether it should be left to the Executive Committee for action after further investigation and developments.

A motion that the report be accepted and that matter be referred to the Executive Committee for action was carried

The convention then adjourned until 9:30 o'clock Saturday morning.

Saturday Morning Session

The Saturday morning session was called to order by Chairman Chambers at 9.40. The Secretary read the proposed Rules of Order for the Mechanical Section and then said:

Rules of Order

The Rules of Order as read corresponded with those printed in the *Railway Age* of March 7, 1919, page 535, with the exception of the paragraphs printed below.—EDITOR.

(c) Any person having such knowledge of science or practical experience in matters pertaining to the construction of motive power or rolling stock as would be of special value to the section may be admitted by the General Committee as an affiliated member on being recommended by three representative members. Affiliated members shall be entitled to all the privileges of representative members excepting that of voting on matters submitted to written or printed ballots and being elected to office in the section and may serve on committees on appointment by the General Committee, in addition to the regularly elected members of such committee.

Such membership shall continue until written resignation is received by the secretary or the membership is terminated by the General Committee or by the members becoming engaged in business which, in the judgment of the General Committee, would impair his usefulness to the section or discriminate against others similarly engaged. Affiliated members shall not be subject to dues or assessments.

(d) Representative members who have been in good standing twenty years, or members who have served as President of the Master Car Builders' or American Railway Master Mechanics' Associations or chairman of the section become life members.

(e) Those persons, active or representative members, who have been in good standing in either the Master Car Builders' Association or the American Railway Master Mechanics' Association for twenty years, or members who have served as president of either association or as chairman of the section become life members. Those now carried by the Master Car Builders' Association as life members or by the American Railway Master Mechanics' Association as honorary members will be continued as life members of Section Three—Mechanical.

8. (b) In all ballots for chairman, vice-chairman, members of General Committee and Committee on Nominations at the meetings of the section, the following form of voting shall be adhered to: An envelope shall be provided on which there shall be a blank space for the name of the railroad, and the name of the official voting; smaller envelopes shall be provided on which shall be printed the words "For Officers," "For Members General Committee," "For Members Committee on Nominations," and otherwise unmarked. In these envelopes the ballots shall be placed by those voting them and they shall then be placed within the larger envelope and presented to the general tellers. When a ballot is to be taken the chairman will announce the names of all required tellers. Three general tellers shall have charge of receiving and recording the ballots cast. When all ballots have been cast these tellers will announce that the polls are closed. They shall then remove the smaller envelopes, count and announce the vote for officers and shall deliver the envelopes marked "For General Committee" to two tellers, who shall count and announce to the general tellers the vote for General Committee and those marked "For Committee on Nominations" to two tellers who shall count and announce to the general tellers the vote for the Committee on Nominations.

(d) When a ballot for officers or membership on committees shall be announced as having eventuated in a tie vote, or be otherwise undecided, upon such announcement the final result shall be determined by the majority of the members present.

9. (a) Unless otherwise provided herein, a vote in the session of the section may be taken *viva voce*, by arising, or by written or printed ballot. In a vote taken by written or printed ballot only representative members and representatives of the United States Railroad Administration shall participate. Letter ballots may be ordered to be taken in such manner and under such conditions as the section may by resolution from time to time or the General Committee may direct.

(b) Votes on letter ballot on all measures affecting the interests of the railroads represented, which a majority of the Association decide, shall be determined on the basis of cars and locomotives owned, or which are in use or process of purchase by the railroad. Votes on car standards shall be on the basis of one vote for each 1,000 cars and on locomotive standards on basis of one vote for each 100 locomotives. The ballot shall be cast by the representative member in the section designated by the federal manager or executive officer of the member of the Association.

(c) Printed ballots for use in the election of officers, members of the General Committee and the Committee on Nominations, to be of the form as prepared by the Committee on Nominations.

(d) Printed ballots for use in letter ballots to be of the form as prepared by the General Committee.

A motion that the Rules of Order, as read by the Secretary, be received and adopted, was put to vote and carried.

Report on Train Lighting and Equipment

J. R. Sloan
Chairman

THE COMMITTEE HAS CONFINED its efforts this year to developing a proposed standard basis for the rating of car lighting axle generators and a method of testing to determine this rating. Some consideration was given to the subject of a proposed general specification for axle generator car lighting equipment, but it was found impracticable to give sufficient study to the subject to submit a report.

There is not, at the present time, any method of rating axle generators, or of testing them to ascertain their rating, that has been accepted by any society or association. The various manufacturers have their own basis of rating and some few of the railroads cover the subject in their specifications, but there is no generally accepted method. In order that when quotations are received from axle generator manufacturers the purchaser may compare them on an equal footing, it appears essential that there be an officially recognized method of rating and of testing to determine the rating.

The current carrying capacity of any electrical apparatus, including axle generators, is dependent upon the ultimate temperature attained by the insulation. The materials used as insulators have been divided by the American Institute of Electrical Engineers into three classes: Class A, Class B and Class C. Class *A* insulation consists of cotton, silk, paper and similar materials, when so treated or impregnated as to increase the thermal limit, or when permanently immersed in oil; also enameled wire. Class *B* insulation consists of mica, asbestos and other materials capable of resisting high temperatures, in which any Class "A" material or binder is used for structural purposes only and may be destroyed without impairing the insulating or mechanical qualities of the insulation. Class *C* insulation consists of fireproof and refractory materials, such as pure mica, porcelain, quartz, etc.

The maximum temperatures to which these various types of insulation may be continuously subjected have been determined by the A. I. E. E. to be as follows:

Class of Material.	Maximum Temperature to Which the Material May Be Subjected.	Maximum Temperature Rise.
*Class A	105 Deg. C.	65 Deg. C.
Class B	125 Deg. C.	85 Deg. C.
Class C	No limits specified.	.....

* For cotton, silk, paper and similar materials, when neither impregnated nor immersed in oil, the highest temperature and temperature rises shall be 10 deg. C. below the limits fixed for Class "A" insulation.

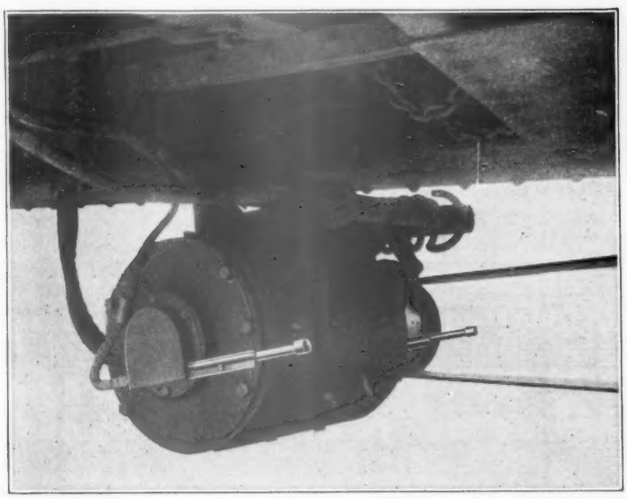
It is further provided that the above temperatures are based on a standard ambient temperature of 40 deg. C., and that when the temperatures are determined by thermometer readings, 15 deg. C. shall be added to the highest temperature observed. This correction shall apply to insulated windings, but no correction is required for commutators, while the correction for bare copper solenoids, etc., is 5 deg. C. Class *A* insulation is now generally used in axle generators, except on commutators where Class *B* is used.

The test to determine the rating will necessarily be made in the shop, where the conditions of operation are quite different from what they will be in actual service.

With a constant field current, the e. m. f. of any generator is directly proportional (within limits) to the speed, and with constant speed it is directly proportional (also within limits) to the field current. As satisfactory illumination and lamp life are dependent on an approximately constant voltage, it is obvious that the generator voltage should be maintained between as narrow limits as the range of charging voltage of the battery will permit. Also to maintain the voltage within these limits, it is apparent that the field strength must vary approximately inversely as the train speed, and therefore the maximum field current will be at the minimum train speed.

As the heating of the generator is due principally to the energy dissipated in the fields and armature, the maximum heating must occur at a speed of the armature that will generate sufficient voltage to make the generator carry the current, and as the maximum temperature is limited, the object of a capacity test or heat run is to ascertain the maximum current that can be carried without exceeding this temperature limit, and this heat run must necessarily be made at the minimum r. p. m. that will generate the rated voltage and current.

In service, the following conditions occur, all of which tend to affect the temperature, as compared with operation on the stand: 1. The commutator's hand-hole covers must be in place, tending to increase the temperature, as the heated air enclosed in the generator cannot escape, while on the stand test they are customarily removed. 2. Due to the movement of the train, the axle generator is subjected to a very effective air wash, tending to decrease the temperature. 3. The intermittent character of the load, due to the train speed falling below the "cutting-in" speed on account of slowdowns and stops will tend to decrease the temperature. 4. The ambient temperature will rarely attain a value of 40 deg. C., and when it does, only for a comparatively short time. 5 The time at which the load on the axle generator is likely to be greatest during the day is the time at which the ambient



Generator with Thermometers Applied to Bearings

temperature is likely to be least, and vice versa. What the railroad car lighting engineer desires to know is what the capacity of the axle generator will be in service and not what it may give on a stand test.

A Series of Tests

The committee has, therefore, conducted a series of tests with a view of determining: 1. The rating of an axle generator. 2. A method of testing to determine this rating. 3. If possible, the relation between the capacity as found on the stand test as compared to the capacity in actual service.

These tests are as follows: 1. Stand test for five hours to attain maximum temperature. 2. Stand test for five hours at manufacturer's rated full load. 3. Road test with generators forced to carry manufacturer's rated full load. 4. Road test operating normally. 5. Stand test under same conditions as No. 3. 6. Stand test under same conditions as No. 4.

The apparatus used in making these tests was as follows: A standard make of body-suspended axle generator, rated at 40 volts and 41 amperes net output. A standard make of car lighting battery, rated at 150 ampere hours' capacity, having a normal charging rate of 30 amperes. The number of cells

was varied as conditions of load and temperature rendered necessary. Weston portable ammeters and voltmeters. Esterline recording ammeters and voltmeters. Resistance and mercury thermometers. The instruments were calibrated by comparison with laboratory standards and actual readings obtained were corrected accordingly. The axle generator equipment with the thermometers in place is shown in the photograph.

To make the road tests the generators and battery were applied to Pennsylvania steel coach 1893, and the car was placed in service on train No. 12, operated between Pittsburgh and Philadelphia. The results obtained on this run did not prove satisfactory, on account of the cooling due to the frequent stops of train No. 12 between Pittsburgh and Harrisburg, while between Harrisburg and Philadelphia the run was covered at high speed with few stops, with the result that the temperature of the generator was still rising at the end of the run.

The car was, therefore, transferred to train No. 44, operating between Pittsburgh and New York, and on this run a number of tests were made. Train No. 44 has a faster schedule and less stops than train No. 12, and it was noted that the temperatures attained on the run made on train No. 44 were higher than the temperatures attained on train No. 12. This indicated that the intermittent load obtained on No. 12, due to the frequent stops, more than compensated for the increase in field current at the lower speed.

Considerable difficulty was encountered in obtaining concordant data on these runs, due to the fact that in some of them the control was hand operated and also to other factors over which we had no control. The results obtained from runs Nos. 12, 13, 15 and 16 were selected as being the most representative of the conditions and as conforming most nearly to the normal schedule of the train. On these tests, temperature readings were taken at 30-minute intervals and immediately before and after stops.

Following these road tests, the entire equipment was removed from the car and set up for operation in the shop, where road tests Nos. 12, 13, 15 and 16 were duplicated as closely as possible with regard to load, number and duration of stops and average speed. It should be noted that the speed in the shop tests was not the actual speed as obtained on the road, but the average speed obtained by calculation on the basis of distance and running time between stops.

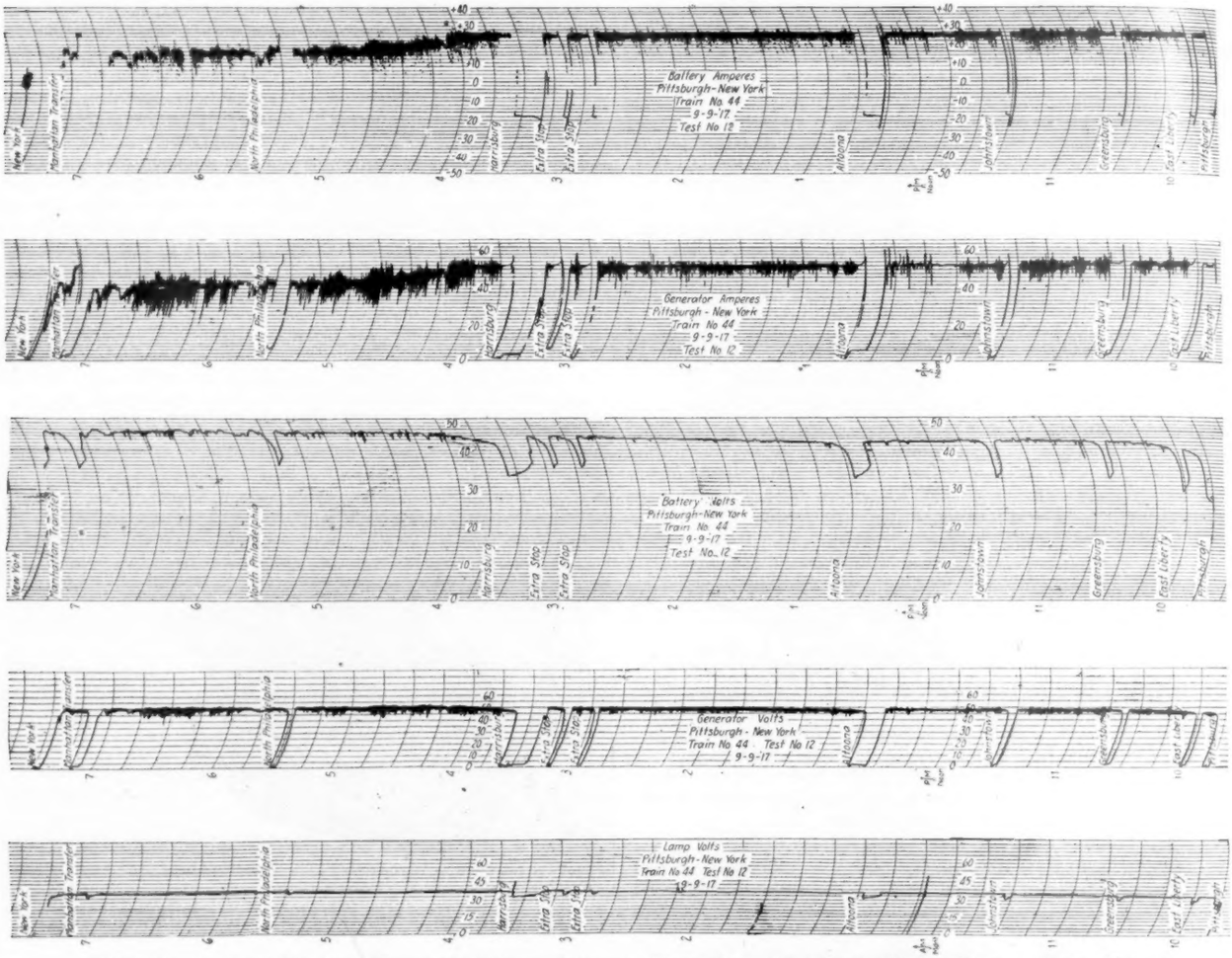


Plate No. 5.—Test No. 12.—Electrical Values—Normal Operation—45 "Load Side" Volts. Train No. 14.

The data accumulated on these tests are shown on the following plates:

PLATE.	TEST.	DATA.	DESCRIPTION.
1	S-1	Electrical Values....	Run five hours at 43.5 load side volts and constant current value to attain maximum allowable temperature.
2	S-1	Temperatures	
3	SS-1	Electrical Values....	Run five hours at manufacturer's rating 43.5 load side volts, 41 net amperes constant load.
4	SS-1	Temperatures	
5	12	Electrical Values....	Road test, normal operation, 45 load side volts.
6	12	Temperatures	
7	12-A	Electrical Values....	Duplicate of test No. 12 on Stand.
8	12-A	Temperatures	
9	13	Electrical Values....	Road test, constant load 41 amperes net, 45 load side volts.
10	13	Temperatures	
11	13-B	Electrical Values....	Duplicate of test No. 13 on Stand.
12	13-B	Temperatures	
*13	15	Electrical Values....	Road test, constant load 41 amperes net, 43.5 load side volts.
14	15	Temperatures	

PLATE	TEST	DATA	DESCRIPTION
*15	15-A	Electrical Values....	Duplicate of test No. 15 on Stand.
16	15-A	Temperatures	
17	16	Electrical Values....	Road test, normal operation 43.5 load side volts.
18	16	Temperatures	
19	16-A	Electrical Values....	Duplicate of No. 16 on Stand.
20	16-A	Temperatures	
21	S-1 SS 12 12-A 16 16-A	Temperatures	Comparison.
22	S-1 SS 13 13-B 15 15-A	Temperatures	Comparison.

* NOTE.—The electrical data for tests 15 and 15-A were lost and cannot, therefore, be submitted.

[Due to lack of space the charts accompanying the report are not all reproduced.—EDITOR.]

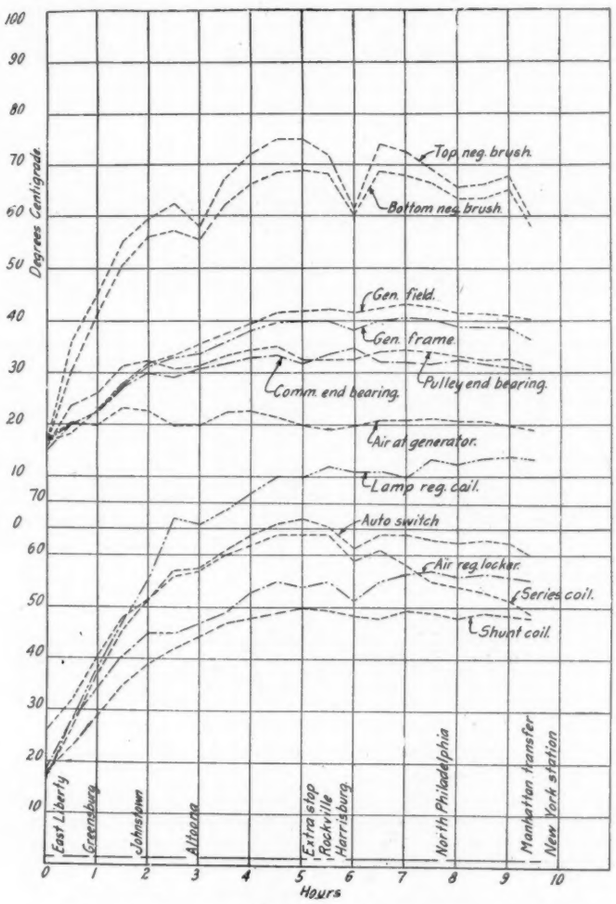


Plate No. 6.—Test No. 12. Temperatures—Normal Operation, 45 "Load Side" Volts. Train No. 44

On Plate No. 21, considering the curves for tests 12 and 12-A after the sixth hour, when the temperature of the fields had attained practically constant values, it will be noted that the rise in temperature (generator operating in normal manner at 45 load side volts) is 21.3 and 30.7 degrees, respectively, the difference in rise being 9.4 deg. C. Considering the curves for tests 16 and 16-A, also after the sixth hour, the rise in temperature of the fields (generator operating in normal manner at 43.5 load side volts) is 22.85 and 30.46 degrees, respectively, the difference in rise being 7.6 deg. C.

On Plate No. 22, considering the curves for tests 13 and 13-B after the sixth hour, when the temperature of the fields had attained practically constant values, it will be noted that the rise in temperature (generator operating at a forced output of 41 net amperes at 45 load side volts) is 23.6 and 33.2 degrees Centigrade, the difference in rise being 9.8 degrees C. Considering the curves for tests 15 and 15-A, also after the sixth hour, the rise in temperature of the fields (generator operating at a forced output of 41 net amperes at 43.5 load side volts) is 26.1 and 29.9 degrees Centigrade, respectively, the difference in rise being 3.8 degrees.

The difference in rise in the above tests, which, so far as electrical values were concerned, were as near identical as possible, is accounted for by the different conditions of heat radiation on stand and road. The rise in temperature of the field, as shown in curves for stand test SS-1, is 25.5 deg. C. at the end of five hours. This rise is greater than the rise under road conditions as found in tests 12, 16 and 13, and only slightly less than was found in test 15. Also the difference in rise between corresponding stand and road tests is 7.6 deg. for normal operation and 3.8 deg. for forced load operation.

When it is considered that in making what is called the normal operating tests the tests were intentionally started on a battery that was only about one-quarter charged, and that the output of the generator was, therefore, greater than it usually would be in regular service, and also taking into account that the tests were run in very warm summer weather, it is believed that 5 deg. C. can easily be allowed for the difference in operating conditions on road and stand.

The generator was rated by the manufacturer at 41 amperes

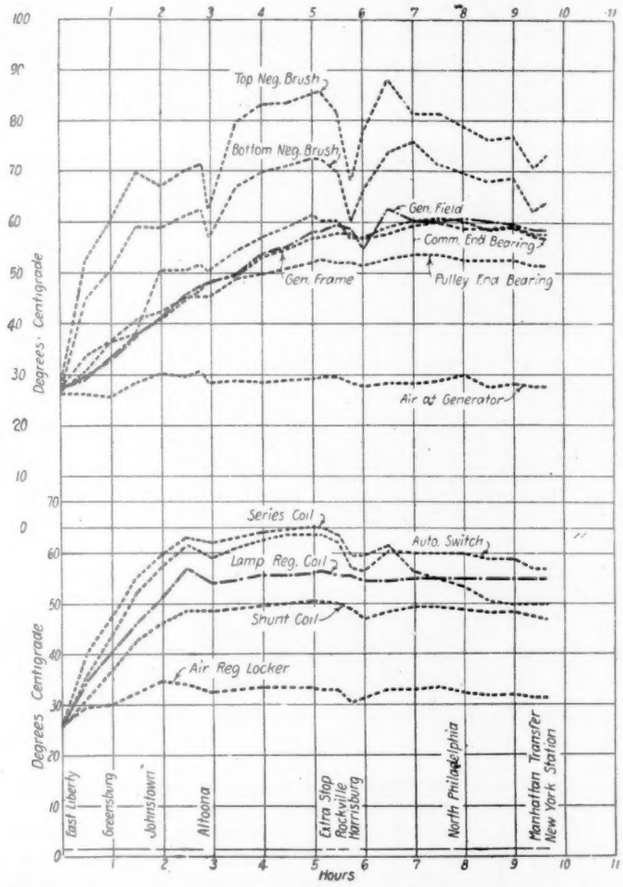


Plate No. 8.—Test No. 12-A. Bench Test Duplicating Test No. 12 on Train No. 44. Temperatures—Normal Operation—45 "Load Side" Volts

net output, so tests were run to determine its actual output. It was inconvenient to obtain the temperature of the field, but it will be noted in the other tests that the field and armature temperatures very closely approximate each other. From these tests, test S-1 was selected as being nearest the condition desired, *i. e.*, a rise of temperature of 65 deg. C. This test was run at 58 net amperes and the actual rise in temperature of the armature, the hottest part of the generator, was 67.5 deg. C.

The ambient temperature of an axle generator in actual service is rarely over 90 deg. F. or 32 deg. C., except in cer-

tain limited sections of country where it may attain a temperature of 100 deg. F. or 38 deg. C.

The committee would, therefore, recommend the following:

1. That the method of testing to determine the rating of an axle generator be as follows: (a) That the generator, together with the generator and lamp regulator, if used, shall be connected in a normal manner to dead load resistance in the battery and lamp circuit, and (b) Shall be operated continuously for five hours, with commutator hand-hole covers removed, at the minimum r. p. m. that will generate rated volts at the load side of the generator regulator and carry the current, and that (c) The net current output shall be the armature current less all current consumed in the generator fields, generator regulator, and lamp regulator, if used.

2. That the rating of an axle generator be based upon the following: (a) The rating of an axle generator, when connected and operated as above, shall be the maximum net current that the generator will carry without exceeding the following values:

	Maximum Observable Temperature.	Maximum Observable Rise in Temperature.
Any part of generator or regulators, except commutator, brushes, brush rigging and bare copper solenoids	110 Deg. C.	70 Deg. C.
Commutator, brushes, brush rigging and bare copper solenoids	130 Deg. C.	90 Deg. C.

3. That the rating test shall be made at or above 15 deg. C. ambient temperature.

4. That a badge plate be securely attached to each axle generator which shall show the following: (a) Manufacturer's name. (b) Type number. (c) Nominal voltage of generator (40 volts for 30-volt system and 80 volts for a 60-volt system). (d) Rating in amperes as above determined. (e) Minimum speed in r. p. m. at which generator will deliver rated volts and amperes.

5. That the above recommendation be submitted to letter ballot as Recommended Practice.

The final meeting of the committee was attended by representatives of all the axle generator manufacturers in this country but one, and the above recommendations were unanimously approved by the representatives attending.

A method of rating axle generators is one of the essential portions of an exle generator specification. The committee, while it realizes that it is impossible to draw a complete detailed specification that would be applicable to all types of axle generator equipment as now commercially manufactured, nevertheless believes that there are a number of essential characteristics that are common to all types of axle generators and which would be included in complete specifications. The committee, therefore, recommends that it be instructed to investigate this matter with a view to drawing up a partial specification which will include the features common to all axle generator equipment.

The report is signed by J. R. Sloane (Chairman), Pennsylvania; C. H. Quinn, Norfolk & Western; D. J. Cartwright, Lehigh Valley; E. W. Jansen, Illinois Central; E. Wanamaker, Chicago, Rock Island & Pacific; A. McGary, New York Central, and L. S. Billau, Baltimore & Ohio.

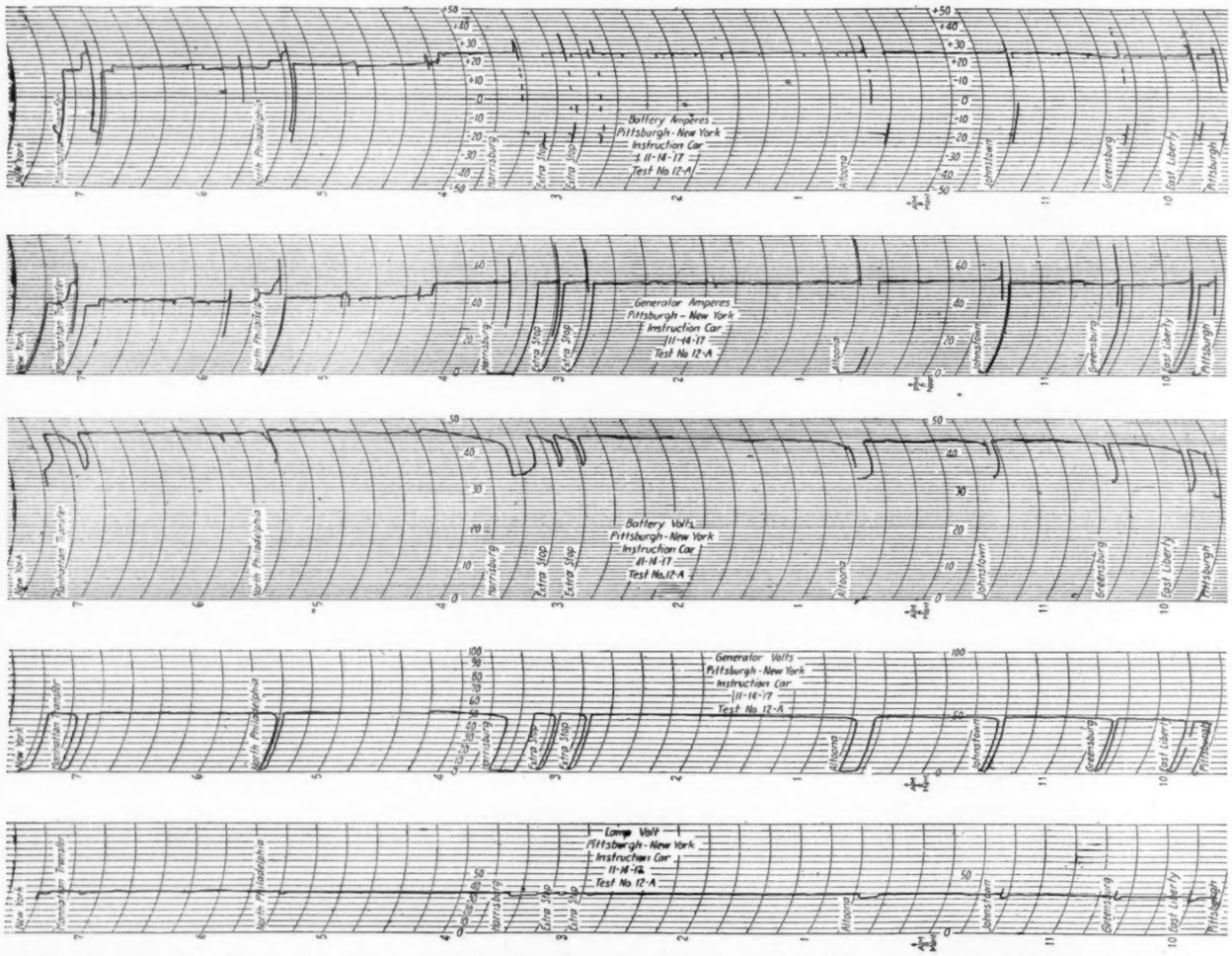


Plate No. 7.—Test No. 12-A.—Bench Test Duplicating Test No. 12 on Train No. 44. Electrical Values—Normal Operation—45 "Load Side" Volts.

Discussion

Mr. Sloane: Referring to paragraph three on page five, my attention is called to the fact that for trains using a slipping belt, the field strength does not vary inversely with the train's

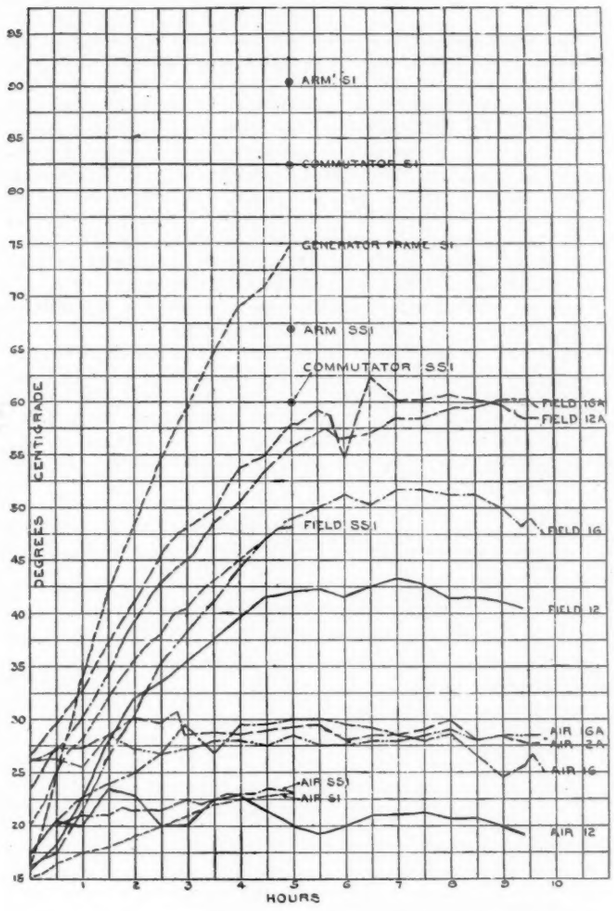


Plate No. 21. Comparison of Temperatures for Tests S-1, SS-1, 12, 12-A, 16 and 16-A

speed. But if you substitute here the words "armiture speed" for the words "train speed" it is practically correct. In the table on page 12, paragraph 2-A, there should be inserted after the words "copper solenoids" the words "resistance units and carbon piles," so it will read "any part of generator or regulator except commutator, brushes, brush rigging, bare copper solenoids, esistance units and carbon piles," shall have a maximum observable temperature, etc."

Mr. Gaines: I move the report be received and the recommendation of the committee be referred to letter ballot, and that the recommendation of the committee relative to further investigation be carried out.

J. H. Davis (B. & O.): The only criticism that I had of the report was in paragraph 3, page 5, to which Mr. Sloane referred in reading the paper.

B. B. Milner (N. Y. C. Line): This report is a very commendable piece of work on the part of the committee. The method of basing the rating of the generators and the method of testing to determine that rating, as reported by the committee, represents pioneer work. As the committee states in its report, it has never been passed on by any society or association.

The N. Y. C. Lines have in operation some 2,800 axle light equipments which were purchased under, and meet, a specification somewhat more severe than that suggested by the committee in its recommendations on page 12. The temperature rise suggested by the committee as shown on that page is 90 deg. C. As applied to commutators, brushes, brush rigging and bare copper solenoids, the maximum temperature rise prescribed in these specification is 75 deg. C. The maximum allowable increase in bearing temperature is 50 deg. C.

Current output, according to paragraph (c), at the top of page 12, is "the armature current less all current consumed in the generator fields, generator regulator and lamp regulator, if used." The rating of current which the N. Y. C. Lines has been using is the serviceable current, that is the current measured at a point nearest the lamps and the batteries. The paragraph referred to might be made to cover that by including some additional relays or automatic switch solenoids which might be a part of the testing equipment. The service test prescribed is paragraph (b) on this same page is for some five hours under regular conditions of load and speed. Under the specifications referred to the

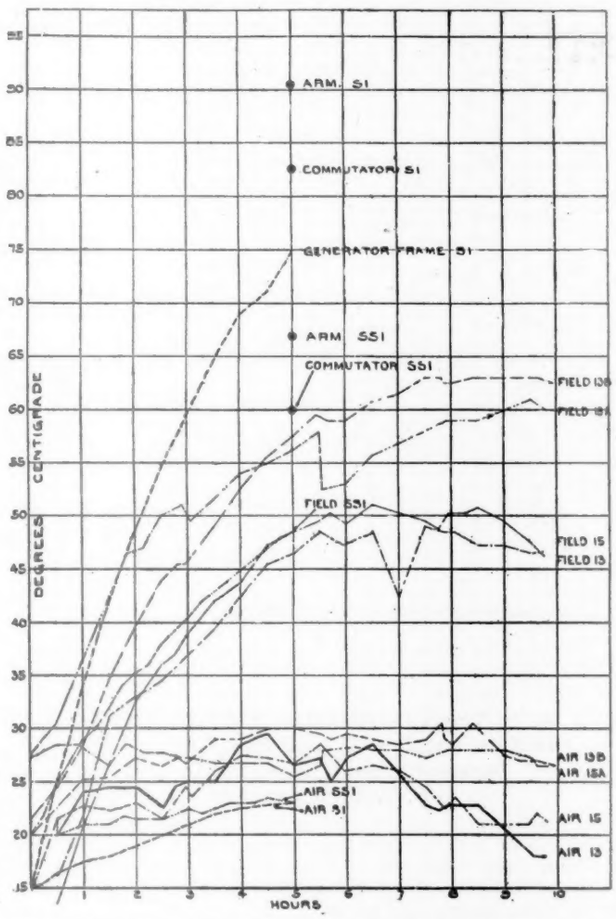


Plate No. 22.—Comparison of Temperatures for Tests S-1, SS-1, 13, 13-B, 15 and 15-A

fifth hour of that period of testing is replaced by 15-minute tests with increase in speed and load set up to cover unusual conditions under which the generators may be called to operate.

Mr. Sloane: In regard to Mr. Milner's remarks about 1-C, the net current is specified as the armature current less all current consumed in the generator field, generator regulator, and lamp regulator, if used. That means that what current is put down as net current is what is available for use. We had a fully attended meeting of the committee and representatives of the axle generator companies, and this question of the N. Y. C. specifications was brought up. The committee decided that it could be omitted; that it did not consider that the service which an axle generator underwent was so severe that it had to put an additional test on it. I have received the following communication:

"In the replies from New York Central Lines roads to M. C.

B. Circular No. 29, dated January 1, 1919—Circular of Inquiry of the Committee on Standards and Recommended Practice—is included the following from I. S. Downing, G. M. C. B., C. C. C. & St. L., Indianapolis, Ind.:

"There are different ideas and systems of applying generator pulleys to axles of passenger equipment cars. Some roads use

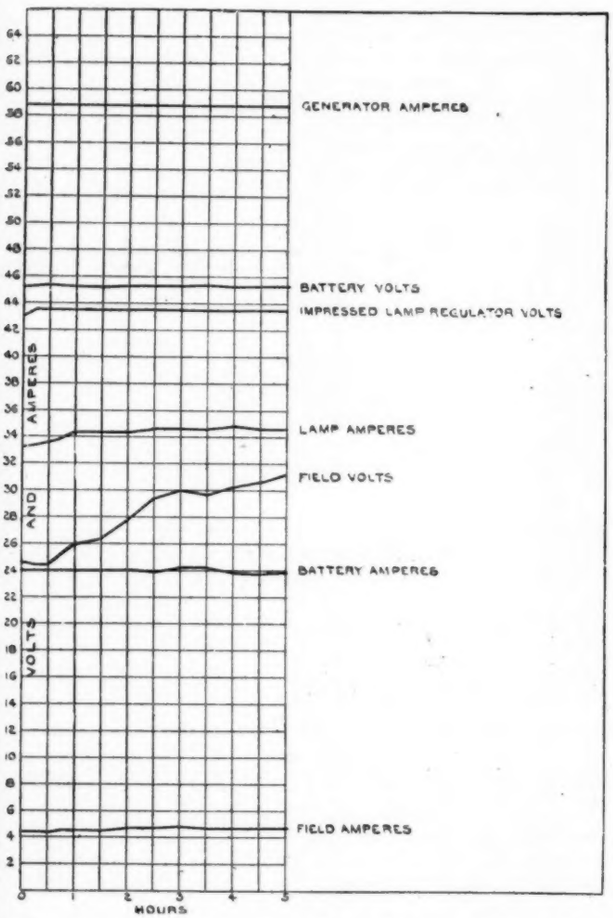


Plate No. 1. Test S-1.—Heat Run: Electrical Values—Load: Dead Resistance, 43.5 "Load Side Volts," 58 Net Amperes; Speed 16 M. P. H., 333 R. P. M. of Armature

special axles for the generator pulley, and it would be our recommendation that such pulleys be designed to conform to standard M. C. B. axles and avoid having special designed axles to accommodate the axle pulley."

(b) "Extract from Minutes of Meeting of the Committee on Standards and Recommended Practice, held in office of the Secretary at Chicago, Tuesday, March 18, 1919.

"It was decided that the subject of generator pulleys for axles of passenger equipment cars, mentioned in letter dated February 13, 1919, from E. Chamberlin, Secretary of Equipment Clearing House, New York City, be referred to the Committee on Train Lighting and Equipment."

I answered that letter to the Secretary of the Committee on Standards. I will quote in part:

"The Committee on Train Lighting and Equipment covered this subject as fully as it could be done, considering conditions as they exist, when they submitted the following recommendations in their report to the 1917 Convention.

"6. Axle Pulleys and Bushing.

"(a) A straight pulley seat shall be provided for the axle pulley.

"(b) If a bushing be used, it shall preferably be secured to the axle independently of the pulley, and shall have an external diameter throughout its length of 7½ in., and be not less than 8½ in. long.

"(c) The hub of the axle pulley shall have a uniform internal diameter of 7½ in., the length of the hub shall be 6½ in.

"(d) The face of the axle pulley shall be not less than 9 in. if flangeless, and not less than 8 in. if flanged.

"(e) The diameter of the axle pulley shall be as large as the construction of the car will permit, preferably 21 in. or 17 in.

"The recommendations were No. 88 in the letter ballot and were adopted, 1817 voting 'yes'; 154 voting 'no' and 'necessary to choice', 1314.

"These recommendations specify that a 'straight' seat shall be provided for the axle pulley but do not say by what means this end shall be attained. They do intimate that a special bushing is preferred, and this implies that a standard M. C. B. axle is used, as, if a special axle were used, the bushing would be unnecessary. They specify how the pulley bushing will be secured, its essential dimensions and also the essential dimensions of the pulley itself. It did not seem possible to prepare a 'standard' in the shape of a dimensioned drawing.

"If you feel that our committee can go further in the matter, please outline clearly what you would propose."

The stand of the committee is that the action desired has already been taken, and is recommended practice of the Association.

W. E. Dunham, (C. & N. W.): It would have more force with the members of the Association if the opinion of the Committee on Train Lighting was expressed a little more dis-

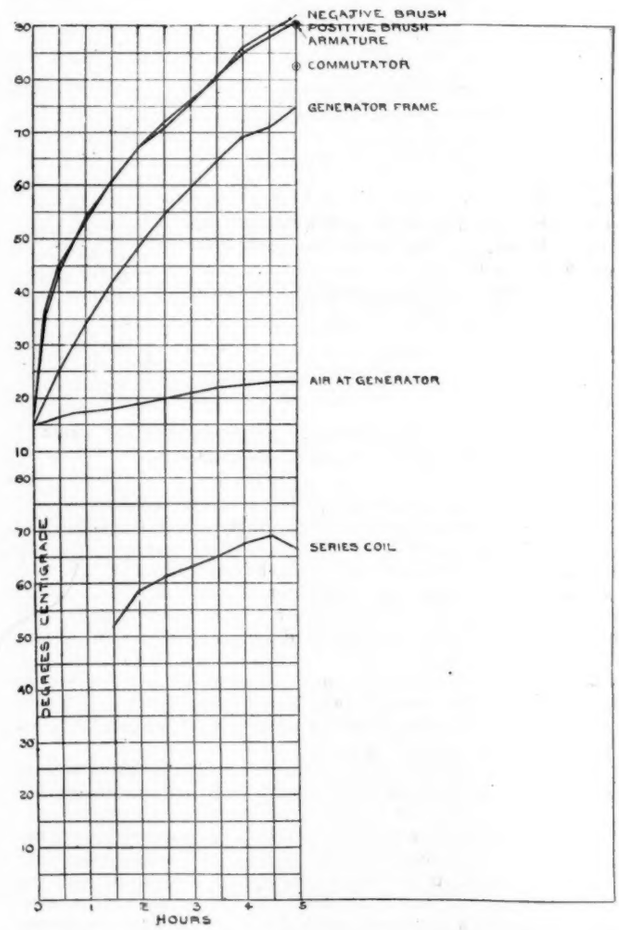


Plate No. 2.—Tests S-1.—Heat Run: Temperatures—Load: Dead Resistance, 43.5 "Load Side" Volts, 58 Net Amperes; Speed 16 M. P. H., 333 R. P. M. of Armature.

tinctly in recommended practices and standards. An axle shown in the recommended practices has a straight seat, and it is the appearance of that axle in the proceedings which leads a great many to continue to use it. I would like to see the action of

the Convention such that the straight sided axle will be eliminated entirely from the records.

Mr. Milner: I support the elimination of the special axle, or what appears to be a special axle, from the records of the Association. The N. Y. C. lines, are eliminating its use, and using only M. C. B. standard axles to which bushings are applied. If paragraph C, at the top of page 12, were amended in accordance with Mr. Sloane's remarks, it would be entirely clear.

Mr. Gaines: If we want to eliminate the special axle and adopt the standard axle in connection with car lighting, that is a subject of recommended practice and letter ballot. I would, therefore, add to the motion that the question of eliminating the special axle, and the adoption of the standard M. C. B. axle in connection with car lighting, be referred to letter ballot.

Mr. Sloane: We did not have a special axle. We say if you use it, make it thus and so, so that when you get your pulley bushing on it will conform to the same bushing as the M. C. B. axle, and be interchangeable.

Mr. Davis: I was chairman of the Train Lighting and Equipment Committee in 1917, and we made a special effort to steer clear of special axles, and I don't think you will find a thing in any of the reports of the committee which requires a special axle. If the Committee on Standards should see fit to eliminate the special axle shown, there certainly will be no objection on the part of the Car Lighting Committee.

B. B. Milner (N. Y. C. Lines): I believe that the interests of the Association and the interests of the railroads are somewhat broader than as stated by Mr. Sloane, and it seemed to me that some action should be taken in connection with the elimination of the special axle. As a matter of information, I would like to ask Mr. Sloane how many cars are carrying these special axles.

Mr. Sloane: The committee cannot state how many roads or how many cars are using special axles. We considered that the axle was out of our province, and what we considered our duty was to report on the conditions whereby we could make the pulleys interchangeable.

C. B. Keisel (Penna. Lines): It seems to me that the axle has nothing to do with this. The committee stated that it made the pulleys interchangeable so that you could use either the standard axles or the special axles, as you pleased.

Mr. Gaines' motion, with the addition, regarding the special axle and adoption of the M. C. B. axle was then put to vote and carried.

Election and Other Business

F. F. Gaines: While the Secretary is busy with the tellers, I want to offer him a bouquet as I think it is due him. I do not think we have ever had a convention where things have been so conveniently arranged. Every morning we get the papers in a nice envelope, and everything we are to have for the day is right before us.

The Chairman: A great many improvements could be made in this room. We changed the arrangement this morning because of the bad conditions of the speaker's rostrum when it was at the other side of the room. If anyone talked from the back of the hall his voice struck the big girder and died at that point. The arrangement this morning was the old arrangement before the extension was built. I think we have a right to request at least, of the pier owners, that during the sessions some of this noise be eliminated. They started to rebuild out there the other day about the time we started our prayer, and there is no necessity for it at all. We have a right to stop these things, and I think by requesting it we will get that improvement. This Convention has grown with great rapidity in the last fourteen years, and these things need revision.

Mr. Cromwell: I don't think cutting windows on the side is quite the thing. The first day of the Convention I sat near the window there and there was a little too much ventilation. I had to move toward the center where I found it too hot. I think what we need is a passenger car deck above here to let this hot air out.

Here the Secretary read the report of the election which resulted in the election of W. J. Tollerton as Chairman of Section III, Mechanical, and of other officers. The results are given in full on another page of this issue:

Chairman: You have heard the result of the election and with that goes the immediate placing of the new officers. I take great pleasure in introducing to you Mr. Tollerton, the Chairman of Section III, Mechanical, for the next two years.

Mr. Tollerton: Mr. Chairman, and members of Section III, Mechanical: I want to say how much I appreciate your selecting me to preside over this section for the next two years, and I shall endeavor in every way possible to handle the work as successfully as it has been handled by my predecessors.

Mr. Tollerton then took the chair and requested Mr. Brazier, of the New York Central Lines, to make a few remarks on the history of the M. C. B. Association, which after over 50 years of existence, is now merged with the consolidated association.

Mr. Brazier Speaks of M. C. B. Assn.

I have prepared a paper touching on the history of the Master Car Builders' Association, but, after listening to the very able and masterly address of Mr. Chambers, who covered the ground so accurately, there was little more I could say. It is a great privilege for me, one of the oldest members in the Association, to be called on to read this paper:

The Master Car Builders' Association has been in existence as an organization for fifty-two years. The Association had its origin in informal meetings which were held by car men of the New York Central Railroad for three years prior to the formation of the Association. It is a privilege briefly to call attention to the long list of honored members of the Master Car Builders' Association, to the efficient work it has done, to its rules of interchange which have made possible the operation and interchange of equipment and to its standard and recommended practices which have been generally adopted by the railroads of the country. The decisions of its Arbitration Committee have been binding on its members, with a force equal to the decisions of our courts.

In years gone by when most railroads had their Master Car Builders, the Car Department was considered to be an important one. Looking back over the history of the Association and the foundation on which it was built and realizing that in the past few years there has been a tendency on the part of some railroads to consolidate the departments, it is regrettable to note that the prominence of the Master Car Builder has disappeared. Those in charge of the equipment departments, in many cases, are known under a different title.

Our government practically adopted its standards for safety appliances, which, to my mind, was a great compliment to our association. There has been altogether too little attention paid to this important department in recent years. You will find, if the car department is properly managed, and the equipment maintained and improved to the proper standard for present day operating conditions, that the expenditures for labor and material of the car department will be in excess of those of the motive power department.

It might be interesting for you to know the total of payrolls and material disbursed for the year 1918 in both the car and locomotive departments of the New York Central Railroad, Lines East:—

	Labor	Material	Total
Car Department	$12,861,877.44	$9,787,350.90	$22,649,228.34
Locomotive Department	12,109,132.74	5,778,196.30	17,887,329.04
Total	$24,971,010.18	$15,565,547.20	$40,536,557.38

In the last two years and particularly since we have been under Federal control, investigations have shown the importance of the car department in connection with the upkeep of equipment. I believe there is a brighter future for competent car men than there was prior to the period of Federal control.

Like the Constitution of the United States of America, adopted by the forefathers of our country, you can add to it by amendments, but the foundation stands forever. So with the Constitution of the M. C. B. Association; it can be added to or called by any other name, yet the principles stand forever.

There have been twenty-nine presidents of our Association of whom twelve have gone to their reward, nine have retired from railroad service and only eight are in active service to-day. In the list of officers and members of this association there are at the present time but five in active railroad service who have been members for twenty-five years or more: W. K. Carr, chief car inspector, Norfolk & Western; Past President J. J.

Hennessey, master car builder, C. M. & St. P., and E. J. Doyle, master car builder, M. K. & T.

Next on our list is a man whom we all honor and respect. He has been a member of this association for forty years; has served one railroad of this country for over half a century; has filled with honor the position of president of our association; I refer to the dean of the association, our treasurer, J. S. Lentz, master car builder of the Lehigh Valley, and your humble servant completes the number of five.

Badge Presented to Mr. Chambers

Mr. Brazier: Mr. Chambers, I have been selected by the officers and members of the Master Car Builders' Association to present you with the Past President's badge of that association. I trust, sir, you will wear this with pride and when you look back over the work which our association has accomplished in the interest of the railroads of the country that it may bring pleasant recollections to your mind as to the part which you have taken in the work. You have filled the chair and administered the duties of the President of our Association with honor and credit to yourself and to the Association, and when you look upon this badge it will reflect the esteem and confidence of your associates.

I also have the pleasure, Mr. Chambers, of presenting you with the Past Chairman's badge of the A. R. A. You were elected as President of the Master Car Builders' Association in 1917 and in the changes made in our standing, which now places us under the American Railroad Association, you have had the distinction and honor of being our first chairman—in fact, you will be, without doubt, referred to as our war chairman, as you have carried us through this period. This badge is presented to you by the officers and members of the Mechanical Section and I trust, sir, that it may serve to convey to you the appreciation of your associates for the creditable manner in which you have conducted the affairs of the Mechanical Section.

Mr. Chambers' Response

No event in my life will carry with it a more beautiful recollection of the past than the favors conferred upon me as being the last president, or any president for that matter, of the Master Car Builders' Association, and Chairman of Section III, Mechanical. Three years ago, when I was elected to this office, I took it not unmindful of my predecessors; also realizing to the fullest extent my inability to fill the office as it had been filled in the past. However, with your most hearty cooperation, I have done the best I could, and I trust that I have in a measure given satisfaction. I can only say in retiring that I want to offer my heartfelt thanks, not only to the members of the association, but to the secretary, and to the members of the General Committee and Executive Committee, who have unstintingly and without a dissenting vote, favored everything that I wished to put through or get before you. I could not ask in my future ever to have any better support than I have had in the past. Thank you, gentlemen.

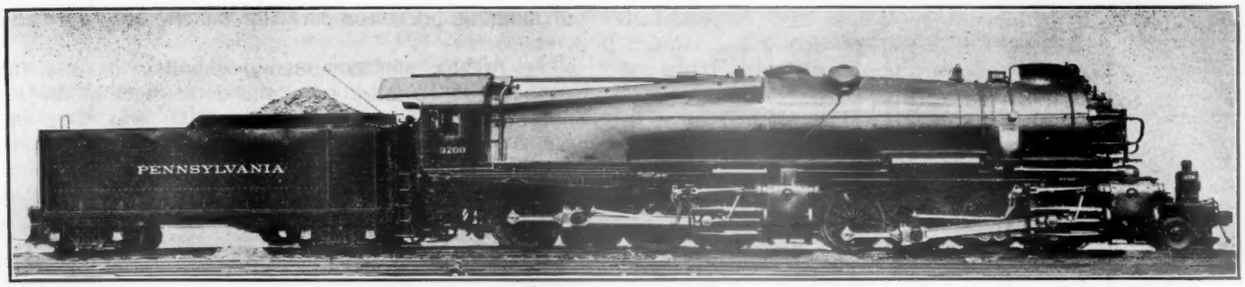
Mr. Hennessey: I move that there be a vote of thanks extended to the retiring Chairman, Mr. Chambers, for the courtesies that all the members have received during his three years as President of the Master Car Builders' Association, and one year as Chairman of Section III, Mechanical.

This motion was seconded and unanimously carried.

The meeting then adjourned.

Special Guests

Anderson, Allan R., M. K. & T., New England.
Anderson, J. B., C. C. to Asst. A. M., Penn., Runnymede.
Ashe, W. O., Ch. Dftmn., N. Y. C., Traymore.
Baldwin, T. W., Asst. Reg. Dir., Alleg. Reg., Marlborough.
Bamberger, Julian E., Pres., Bamberger Elec., Breakers.
Barry, Rich. J., Gen. Insp., N. & W., Louella.
Barton, T. F., M. M., D. L. & W., Traymore.
Beum, H. W., Oper. Statistician, Reg. Dir. Office, U. S. R. A.
Billings, Ambrose, C. R. R. of N. J., Lexington.
Blackburn, H. E., Ins. of Appr., Erie, Y. M. C. A.
Brown, R. M., Asst. E. M. P., N. Y. C.
Brown, Jno. I. Examiner Div. 41, U. S. Patent Office, Wiltshire.
Burkhard, A. A., Genl. For., N. Y. C., New Belmont.
Butts, H. M., Master Painter, N. Y. C.
Clapp, D. A., Trainmaster, Penn.
Collins, Col. L. R., Representative, South African Govt. Rys., Marlborough.
Collins, W. R., Pur. Agt., Erie, Seaview Golf Club.
Conniry, P. J., Shop For., B. & O.
Curren, W. C., Spec. Agt., Staff Reg. Dir., N. Y., St. Charles.
Dally, Carl, C. R. R. of N. J., Lexington.
Davis, James, Foreman Timer, S. I. R. T.
Dobson, J. D., Genl. Supt., B. & O., Bouvier.
Dooley, W. H., S. M. P., C. N. O & T. P., Dennis
Dougherty, Geo. E., Supt. of Equip., U. S. R. R. A., Haddon Hall.
Edwards, Chas., For. Ft. Hps., L. I.
Englebright, E. W., Acting Constg. Eng., U. P., Traymore.
Ennes, S., Gen. Mgr., B. & O., St. Charles.
Faga, H. L., Ch. Clk. Supt., L. & N. E., Pennhurst.
Feather, E. H., Mech. Dept., R. F. & Prt., New Hygeia.
Fisher, C. D., For., W. J. & S. S, Rafters|
Fitzgerald, Wm, Asst. Pur. Agt., Marlborough.
Fletcher, J., Gen. For., Seaboard Air Line, Princess.
Forde, T. J., Mech. Supt., H. I. & D, Marlborough
Freeman, E. H., Gen. Clk., B. & O., Miller Cottage.
Fritchey, F. W., M. M., B. & O., Marlborough
Fryberger, G L., Machine Operator, Penn, Elberon.
Gaffney, J. F., Yd. Condtr., W. J. & S. S., 604 N. Indiana Ave.
Geis, Wm. F., Secy. to Corporate Mech. Eng, B. & O., Bouvier.
Gordon, C. E., R. F. & P., Terminal.
Greene, H. E., Asst. Ch. Pass. Clerk, U. S. R. R. A., Miller
Griffin, J. F., Div. Gen. Car For., N. Y., New Belmont. Cottage.
Hackenburg, J. H., P. A., P. A. & M. C. K., Alamac.
Hall, C. W., For. Loco. Rprs, Penn L W, Traymore
Hall, M. K., Asst. Mgr. of Str. Sec., U. S. R. R A.
Hamilton, R. H., Genl. Mgr, H. I. & D.
Harrison, W. R., M. M., Santa Fe, Breakers.
Harter, Chas., Mech. Eng., Mis. Pac., Ambassador.
Hazel, F. J., Supt., Det. & Tol. Shore Line, Schlitz.
Heckman, A. A., Ch. Clk. M. R. D., Norfolk & Western, Elwood
Heiser, Chas. E., Drafts'm, P. & R., Chester Inn.
Himmelberger, Chas. M., Asst. Trainmaster, C. R. R. of N. J. Worthington.
Hitz, C. D., Spl. Agt., Penn.
de Hoidenstam, R., Capt., American Gas Accumulator Co., Traymore.
Holmes, H., P. & R.
Holmes, J., Dir., N. W.
Hosack, W. K., Gen. For., Westn. Md., Monticello.
Hughes, M. L., Penn., Schlitz.
Hughes, P. E., President Material Agent, Penn., Schlitz.
Johnson, E. Y., Loco. Insp., B. & O., Clarendon
Jones, L. M., Pur. Agt., N. So., Breakers.
Jones, W. N., Gen. Strkpr., Chalfonte.
Joy, C. U., M. M., N. Y., N. H. & H., Osborne.
Julien, T. St., Penn.
Keeber, W. G., Mch. Shop For., C. R. R. of N. J., Lyric.
Kilborn, Jas. E., Pur. Agt., Rutland, Marlborough.
Bressling, E. W., Foreman, W. J. & S. S., Marlborough.
Landis, John D., Jur. Agt., P. & R.
Lepper, C J., Machinist, Penna., Schlitz.
Lipetz, A. I., Chief Russian Ry. Mission, Russian State Rys., Marlborough.
Lohman, C., Shop For., C. R. R. of N. J., Lyric.
Long, M .A., Asst. Ch. Eng., B. & O., Chelsea.
McCann, J. L., Supt. Recl. Plant, Zanesville, B. & O., Miller.
McCawley, H. B., Atty., I. C. C., Blackstone
McConnell, W T., Gen For. Retired, Penn.
McGinnis, T. A., Insp. M. P. Dept, N. & W., Alamac.
McKernan, E. J., Supervisor, Santa Fe, Strand.
MacFarland, H. B., E. T., Santa Fe, Traymore.
Mays, Floyd K., Asst. to Fuel Mgr., A. B. A., Brighton.
Maze Edward J. Asst. Shop For., L. I., 12 Ohio Ave., Atlantic City.
Mitchell, J., Gen. For., C. R. R. of N. J., Pennhurst.
Murphy, W. J., M. B. M., Penn., Traymore
Nelson, W. C., Jr., Reg. Clerk, Penn.
Nohun, J. L., Asst. to Cons. Engr., U. P., Traymore.
Northan, B. L., Gen. Asst. Pur. Dept., N. Y., N. H. & H., St. Charles.
North, J. H., Ch. Clk. to Gen. Mgr., L. & N. E., Pennhurst.
Nichols, Capt. Ralph G., Army Insp Ordnance, Strand.
Oswald, Geo., For. Water Service, L. I.
Palmer, L. W., M. M., E. B. T. R. R & Coal Co



Simple Mallet Locomotive with Short Maximum Cut-off

Pennsylvania Engine Has Unusual Boiler Design; Longest Port Opening Is 50 Per Cent of Stroke

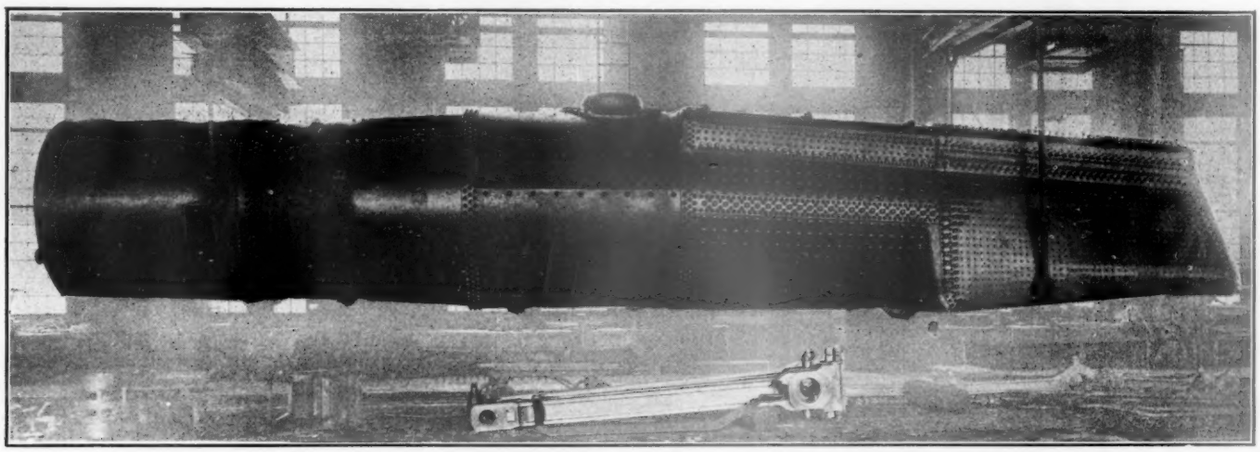
ONE OF THE MOST INTERESTING FEATURES of the track exhibit this year is the simple Mallet type locomotive, Class HC1s, which has just been completed at its Juniata shops by the Pennsylvania Railroad. This locomotive, together with the Pennsylvania Class I1s Decapod and the Class FF1 electric locomotive, is on exhibition at the Pennsylvania Station, at Tennessee Avenue, just off of Atlantic Avenue.

Many unique features are incorporated in the design of this locomotive. Like the Pennsylvania Decapods of the 11s class, the first of which was built in December, 1916, and one of which is also included in the track exhibit, the Mallet locomotive has cylinders designed to produce the maximum tractive effort at a cut-off of 50 per cent. The boiler, with a total equivalent heating surface of 11,360 sq. ft., a grate area of 112 sq. ft., and a barrel combustion chamber 11 ft. 7¾ in. long, is, as a whole, of unusual proportions and incorporates a number of details of construction the fabrication of which involved a high degree of skill and ingenuity.

The locomotive is designed on the basis of driving axle loads of 65,000 lb. to 68,000 lb. at the rail, the eight pairs of drivers thus giving a total adhesive weight of 520,000 lb. to 544,000 lb. The weight of the locomotive in working order is 555,000 lb. to 580,000 lb., while in working order the engine and tender have a total weight of 774,000 lb. to 800,000 lb. In all cases the weights are estimated. With two sets of simple cylinders, each 30½ in. in diameter by 32 in. stroke and limited to a maximum cut-off of 50 per cent, driving wheels 62 in. in diameter and a boiler pressure of 205 lb., it is estimated that the maximum tractive effort, based on driver weight, will be about 135,000 lb.

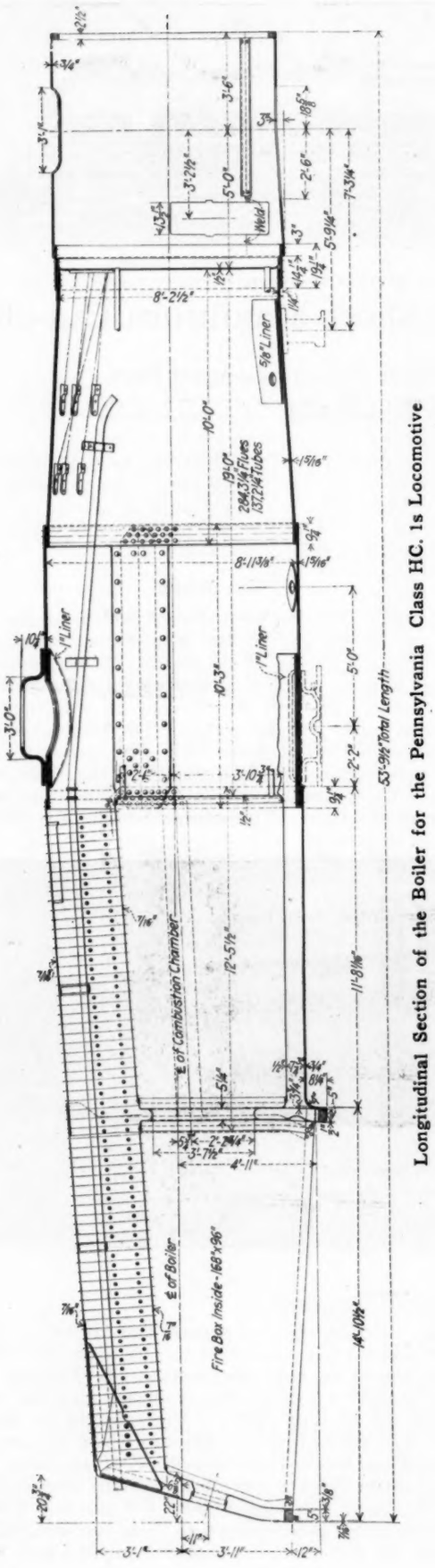
The Boiler

The boiler is of unusual interest both from the standpoint of design and of the methods employed in the construction of some of its details. It may be considered as in three parts, each involving a different type of construction: the two barrel courses, the combustion chamber course and the firebox. The barrel courses are formed of 1 5/16 in. plate. The first course is conical, with a minimum outside diameter at the front end of 96 in. The second course is straight, with an outside diameter of 110 in. This course contains the shoulders for the Belpaire roof connection and, as shown in one of the illustrations, is rolled in one piece, the corners being formed in one operation on the flanging press after the sheet is rolled. The combustion chamber course is made up of four parts: a tapering throat sheet of ¾-in. material, two side connection sheets of the same thickness and a Belpaire roof sheet 7/16-in. thick.



The Boiler

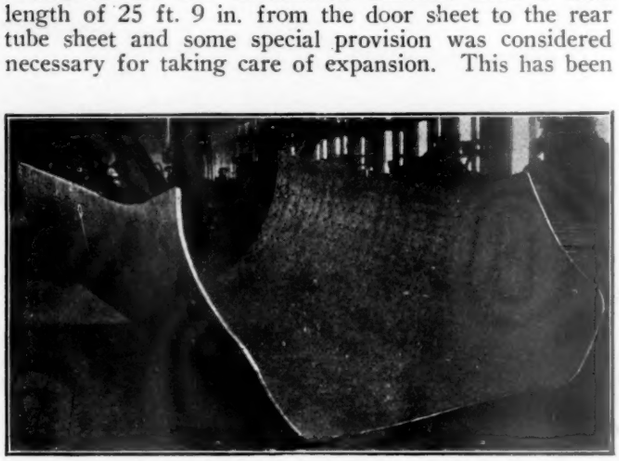
Two of the illustrations show how the throat sheet is formed. After it has been rolled the rear end is heated locally and then broken down to form the mudring connection; the Juniata boiler shop is equipped with a 700-



Longitudinal Section of the Boiler for the Pennsylvania Class HC. 1s Locomotive

ton flanging press for carrying out work of this character.

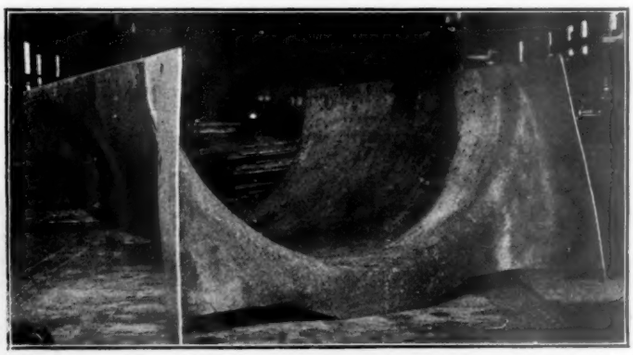
The firebox and combustion chamber have a total length of 25 ft. 9 in. from the door sheet to the rear tube sheet and some special provision was considered necessary for taking care of expansion. This has been



The Throat Sheet before Flanging

made by the insertion of a folded throat sheet connection between the firebox and combustion chamber. The form of this sheet is shown in detail in the boiler drawings, and one of the photographs shows it in place in the firebox. The sheet is formed in two parts, which join and are welded together on the transverse center line of the combustion chamber.

The top half is a comparatively simple flanged channel



The Throat Sheet—Flanged in One Operation under a 700-Ton Press

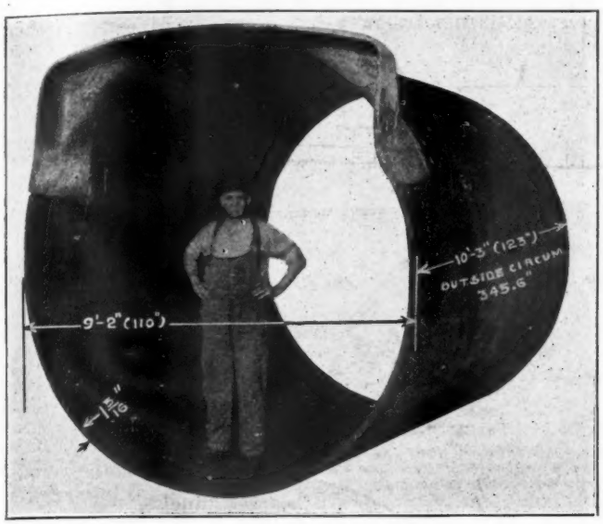
section and is formed under the press in one operation. The fold in the lower part forms in effect a bridge wall between the firebox and the combustion chamber, and here the contour of the inverted U-section makes exceptionally difficult the securing of a satisfactory flow of the metal during the flanging operation. To avoid excessive puckering and drawing of the metal it was necessary to form this sheet in three operations. In the first operation the combustion chamber flange and the contour of the bridge wall were formed by breaking the sheet over a die, the throat and combustion chamber sides of which were separated by an angle of 32 deg. This operation resulted in some upsetting and thickening of the metal in the bend and the throat sheet corners pulled up about three inches. In the second operation the partially finished sheet was placed on a die with the combustion chamber side vertical and the throat sheet side pressed down through an angle of 32 deg. parallel to the combustion chamber side. The corrugation just below

the combustion chamber flange was formed in a third operation.

When completed, the two sides of the channel, which extend completely around the mouth of the combustion chamber, are 4¼ in. apart; the channel has a depth of 5 in. at the top and 14 in. on the bottom center line.

The firebox is built up of separate crown and side sheets, and the combustion chamber of a crown and a half barrel sheet. The adjoining edges of these sheets are butted and electric welded after the firebox is assembled.

The firebox has a length of 14 ft. and the combustion



The Second Barrel Course; Belpaire Shoulders Pressed in One Operation

chamber extends forward into the boiler 11 ft. 7 11/16 in. from the throat sheet. The tubes and flues are 19 ft. long. There are 137 2¼-in. tubes and 284 3¼-in. flues, the latter containing the elements of the type E superheater with which the engine is equipped.

The type E superheater has three vertical headers, one central saturated steam header and two superheater steam headers, one on either side of the smokebox. Each header connection serves a cluster of from two to five units, depending upon the arrangement of the flues. Each unit consists of two loops, each of which occupies one of the 3¼-in. flues.

The boiler is fitted with three 5-in. Coale safety valves and is fed by two non-lifting injectors, one a No. 16 7/10 Sellers, and the other a No. 17 Nathan Simplex. It is also provided with a Sentinel low water alarm. The engine is fired by a Duplex stoker and is also fitted with a Franklin power grate shaker.

The extreme length of the crown sheet makes the question of water level variations due to changes in grade one of great importance. This is particularly true on ascending grades, where the upward slope towards the front of the crown sheet augments the effect of the inclination of the locomotive. Under these conditions the water level at the backhead, as registered in the ordinary gage glass, is no criterion of the condition at the front end of the combustion chamber; in fact, the water level at the backhead may be above the top of the gage glass. Provision has been made in two ways for determining directly the water level at the front of the crown sheet.

Instead of being connected directly into the backhead of the boiler the gage cocks are each connected to a ⅜-in. copper pipe, and the three pipes lead into the boiler through the wrapper sheet near the front end of the combustion chamber, terminating at points respectively 4 in., 7½ in., and 11 in. above the front end of the crown sheet. These pipes are carried back over the top of the boiler to a point just inside the cab in a 3½-in. extra strong wrought iron pipe, opening into the boiler through a special flanged connection and closed at the rear end by a ground joint cap, on the face of which is located the gage cock fixture. Steam for cab auxiliaries is taken from a turret casting let into the wrought iron pipe just outside the cab.

A further check on the water level is obtained by an ingenious device which gives a visible indication of the level of the water at the center of oscillation of the water in the boiler; that is, at the point where the height of the water with relation to the crown sheet does not change with variations in the slope of the locomotive. This point is located about 16 in. ahead of the rear tube sheet.

The operating element of this device consists of a longitudinal arm pivoted in a bracket attached to the shell of the boiler, one end of which carries a float and the other a counterweight balanced so that in water at a temperature corresponding to 205 lb. pressure the float is one-half submerged. The float arm has a downward projecting lever which is conected to the indicator on the backhead by a rod of watertight steel tubing, the weight of which is practically equal to the weight of the water displaced. The indicator consists of two flat springs on the end of this rod, the ends of which bear lightly on the inside of heavy glass windows in a horizontal casing opening into the backhead of the boiler. A disk valve carried near the end of the rod and seating against the inside face of the indicator casing closes automatically in case of failure of either of the indicator glasses. The casing is provided with steam and drain pipes, the former for the purpose of breaking the seal of the disk valve and starting the device after the

The Firebox and Combustion Chamber Connection Sheet

valve has for any reason been closed. The range of this indicator is the same as that of the gage cocks.

Steam Distribution

Contrary to the usual practice in Mallet locomotive design, this engine is driven by two sets of simple cylinders, a relation between boiler capacity and cylinder power roughly equivalent to that obtaining in compound locomotives being obtained by the use of a 50 per cent

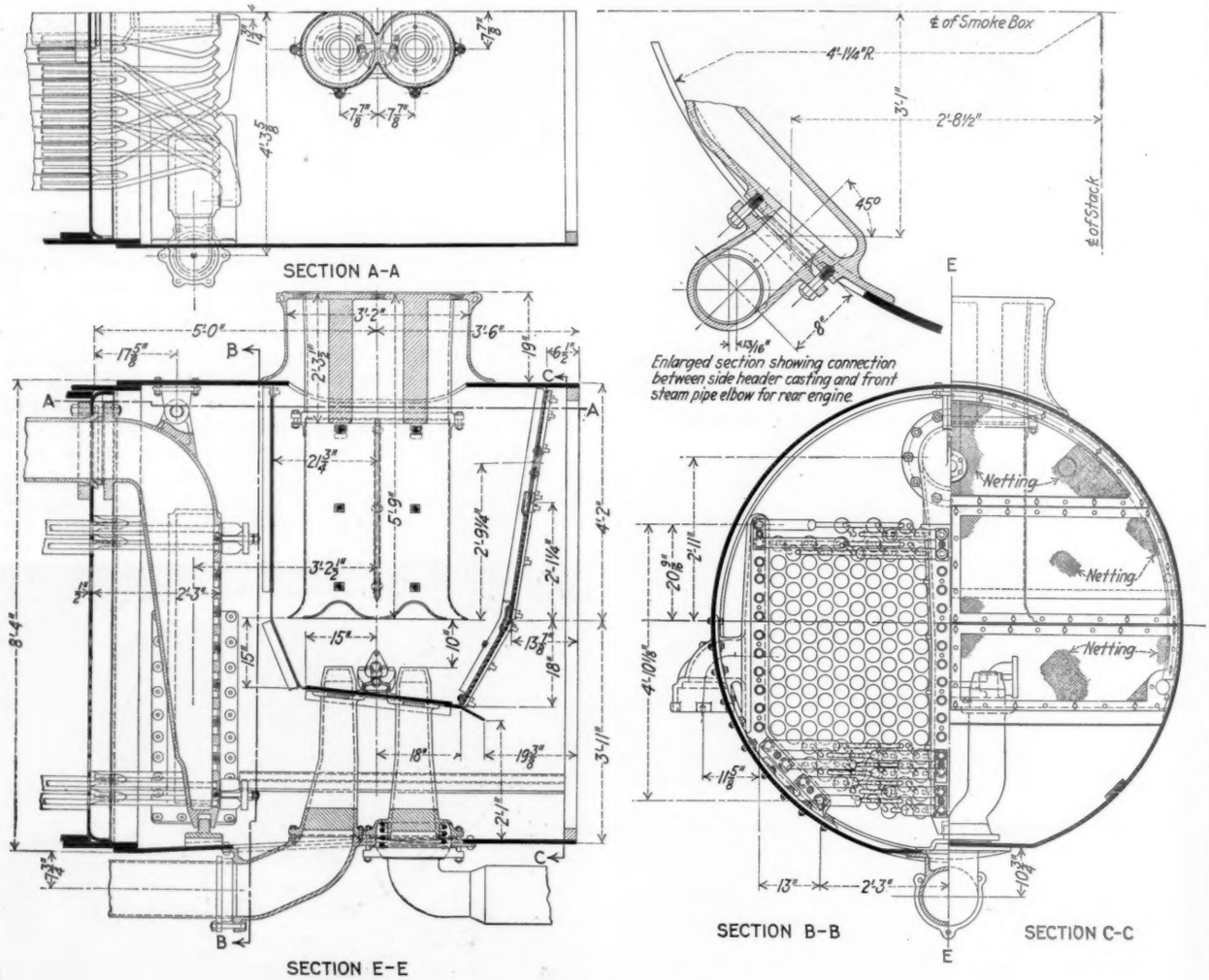
maximum cut-off. This scheme, first tried on the Ils Class Decapod locomotives, was developed in order to eliminate the range of cut-offs in simple cylinders within which the water rate is excessive. As experience has demonstrated that little advantage is obtained by reducing cut-offs below about 25 per cent, it will be evident that at the range of speeds from starting to that corresponding to 25 per cent cut-off, this locomotive works in the most economical range of cut-offs and has a decided advantage in point of steam consumption over a simple locomotive, on which the cut-off varies from 90 to 25 per cent.

With the exception of the 2-in. steam lap employed to limit the maximum cut-off to 50 per cent, the arrangement of the valve gear does not differ essentially from the usual Pennsylvania practice. The long steam lap necessitates, however, the use of some auxiliary method of admitting steam to the cylinders when the locomotive is standing, in order that it may be started from any position of the crank pins. This condition is met by the use of an auxiliary port opening ⅛ in. wide by 1½ in. long, cut through the valve chamber bushing and opening into a recess cored in the inside edges of each valve chamber steam port. The auxiliary ports are so placed that their steam lap is ¼ in., and they serve merely to permit steam pressure to accumulate in the cylinders sufficiently to move the engine and open the main port. Under running conditions the relation of their size to the main ports and the time element is so small that they have no appreciable effect upon the steam distribution.

The arrangement of the steam pipes is shown in one of the drawings. Two connections lead through the smokebox from each of the superheater steam headers. The lower of these openings terminates in an elbow, a pipe from which leads directly back along the shell of the boiler to an elbow connection with the rear unit steam chest, where a slip joint is provided. The upper connection terminates in a ball joint, from which a short vertical pipe leads down to a ball joint elbow casing; from this casing a pipe leads forward to the front unit valve chamber connection, which is also a ball joint.

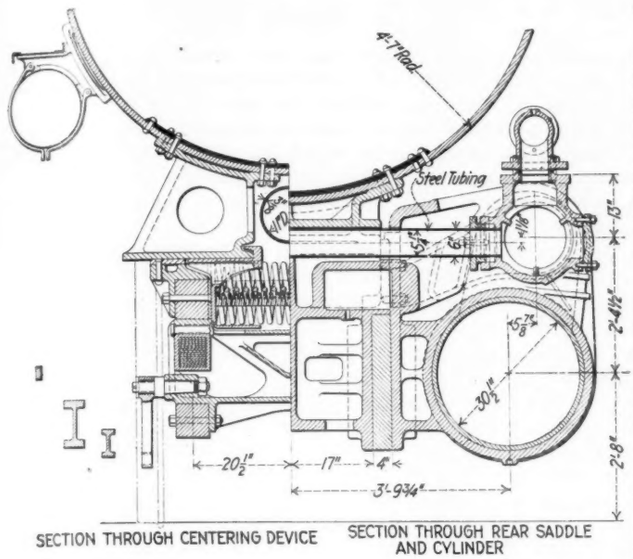
The steam pipes are 6 in. in diameter, and in order to fully utilize the combined opening of the pipes and the superheater elements on both sides of the locomotive, the valve chambers of each unit are connected by a cross pipe 5¼ in. in diameter.

The exhaust pipes for the two units teminate in separate exhaust stands, each of which in turn terminates in a double nozzle. This arrangement is clearly shown on the front end drawing. The openings of the tips are



Front End Arrangement of the Pennsylvania Simple Mallet Locomotive

4½ in. in diameter and the center lines are located at the corners of a square measuring 15½ in. on a side.



The Front Unit Centering Device and a Cross Section Through the Rear Cylinders

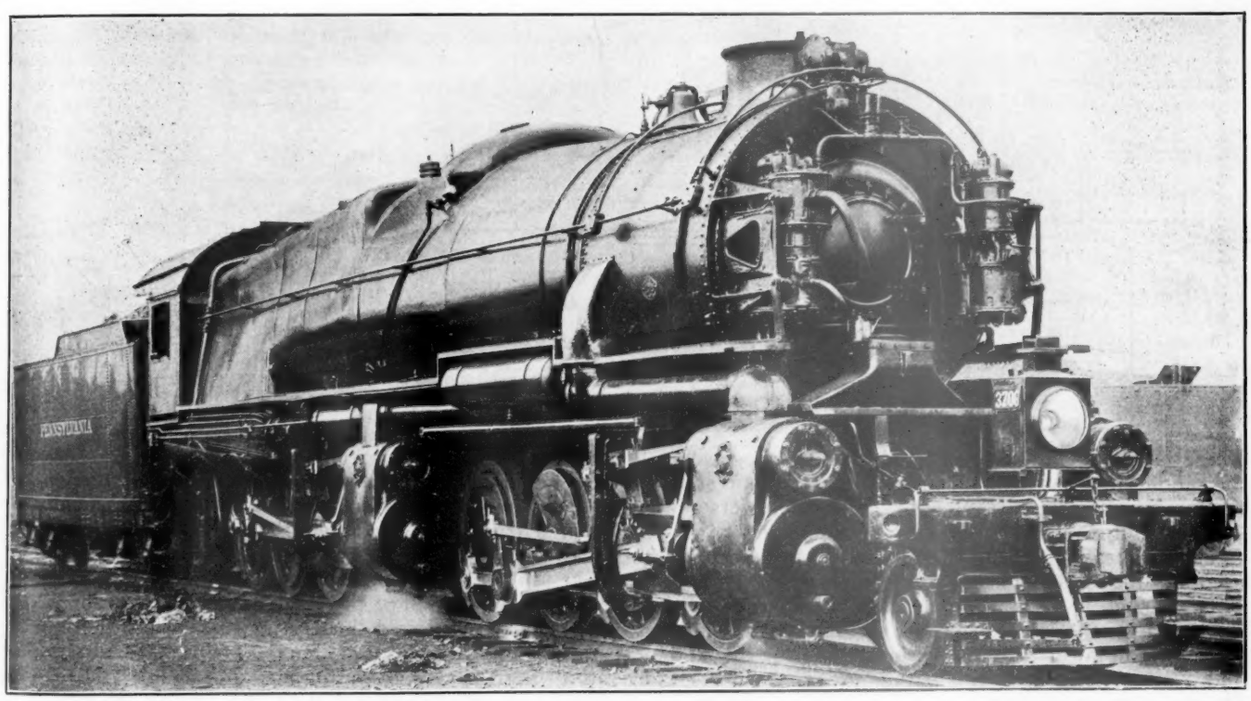
Each tip discharges into a separate stack passage having a minimum diameter of 15 in. The four stacks are cast integral and are contained in a circular shell 3 ft. 2 in. in diameter conforming to usual lines so far as apearance is concerned. The inside stack extends down to the center line of the boiler, 10 in. above the nozzle tips.

Owing to the area of stack passage required for the four simple cylinders, no opportunity was afforded for obtaining a satisfactory ratio of stack diameter to length, with one stack passage. The arrangement described was therefore adopted in order that a more satisfactory ratio of length to diameter might be obtained.

Another interesting feature of this locomotive is the power reverse gear. This is a hydro-pneumatic device, the cylinder of which is made up of two sections, one 16 in., and the other 12 in. in diameter. The cylinder contains a piston of the differential type, the full area of the 16-in. face of which is subjected to liquid pressure. The differential area between the 16-in. and the 12-in. head of the piston is always open to air pressure drawn from the brake system. The outside face of the 12-in. head is not under pressure.

The operation is controlled entirely on the hydraulic side by the admission of liquid to the operating cylinder to move the piston forward and by the release of air pressure from the surface of the liquid supply, carried in a reservoir in the cab, to move the piston backward. The backward movement is caused by the air pressure on the differential area of the piston, which forces the liquid from the cylinder back into the reservoir through a check valve in the control valve. The function of the control valve is to perform these operations only, and it occupies its central, or lap, position at all times except while the piston is actually moving. The position of the gear is shown by a sliding indicator at the side of the control valve. The gear is fitted with a steam connection for use when air is not available.

The purpose in the design of this device was to eliminate the constant tendency of the piston to move against the air cushion in pneumatic gears not provided with a mechanical lock, hence the substitution of an inelastic operating medium for steam or air.



Front End View of the Pennsylvania Simple Mallet Locomotive

The Cylinders and Frames

The cylinders are cast separate from the saddles, and are all interchangeable. Between the cylinders and each

of the saddle connections passes a slab section front frame rail 28-in. deep and 4-in. wide. The front cylinders are lubricated by a two-feed Locomotive Lubricating Company's force feed lubricator and the rear cylinders by a hydrostatic lubricator in the cab.

The articulating joint tongue is cast integral with the rear engine cylinder saddle, and fits between the jaws of the articulating casting bolted between the rear ends of the front engine frames. These jaws are spaced to allow one inch vertical clearance. The tongue is 10-in. deep, bored out to a diameter of 13½-in. to receive the ball joint articulating pin connection.

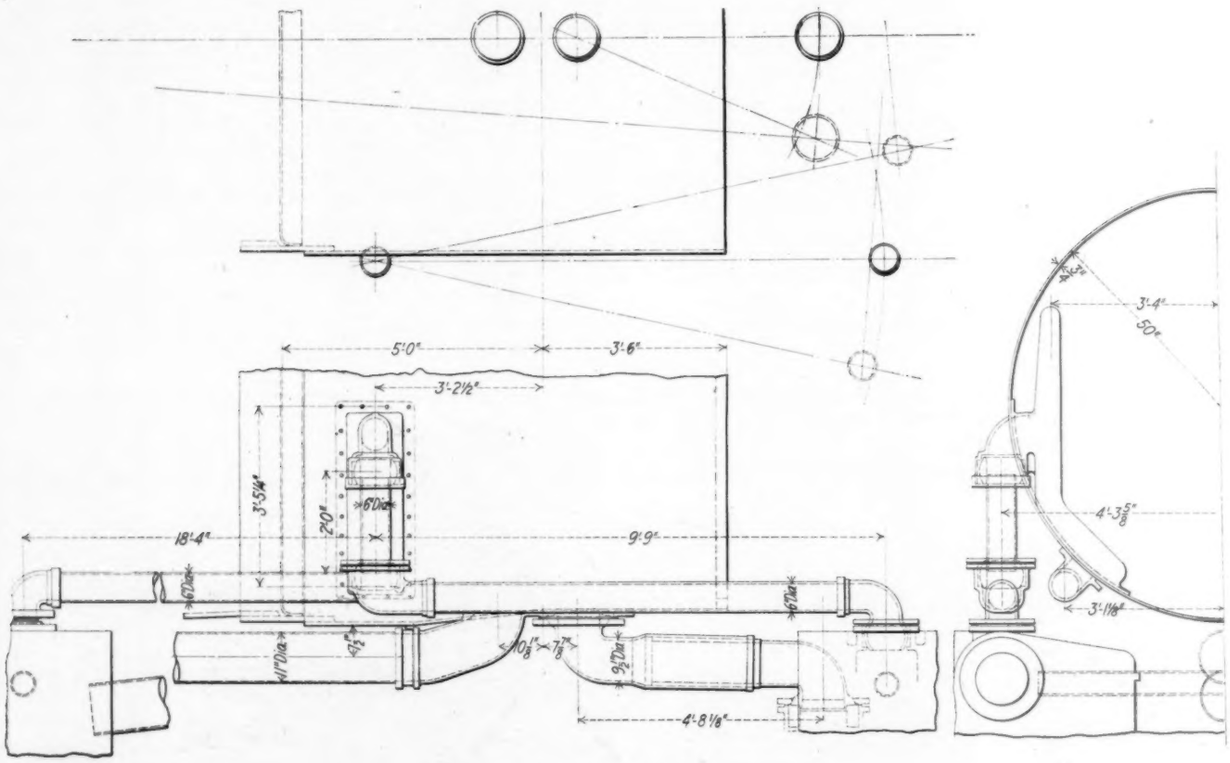
The centering device for the front engine is shown in one of the illustrations. This consists of a group of three triple coil springs placed between follower castings which seat against the inside faces of the top frame rails.

on the I1s class, on which it was first tried, and the first of these engines has been in operation, either on the test plant or in road-service for more than two years.

The Running Gear

The design of the runnng gear details is characterized by a high degree of refinement in the distribution of metal to secure the lightest possible weight for allowable maximum stresses. Hollow sections are employed for the axles, crank pins and piston rods, a practice which has become well established on the Pennsylvania, and the main and side rods are of deep I-section with thin webs.

The locomotive is designed to traverse curves with a minimum radius of 400 ft. and has actually been moved around a curve of 395 ft. radius. The tires on two pairs



The Outside Steam Pipe Arrangement

These are cast with flanges which engage the inside of the saddle castings, so that the springs are compressed by the movement of one or the other of the followers as the engine swings out of alignment with the boiler.

The frames, in detail, are similar in design to those used on the class I1s Decapod locomotives. The top rails are 7½-in. deep and 7 in. wide, the section being thickened on the inside over the pedestals to a width of 9½-in. The lower rails are 6¼-in. thick over the binders and 7-in. thick where the brake hanger brackets and frame braces are attached.

The driving boxes are of straightforward design and are the same as those used on the Decapod locomotives. One point in connection with the design is especially worthy of note. In order to secure a bearing 16-in. long the box has been extended inside the frames so that its center line is one inch inside of the center line of the frames and spring rigging. The eccentricity of journal loading thus effected has shown no undesirable concentration of wear at the outside ends of the boxes or axles

of drivers on each engine are flangeless. On the rear engine these are placed on the second and third pairs. On the front engine they are placed on the second and fourth pairs, thus relieving the tendency to cramp the rear wheels of the front unit and the front wheels of the rear unit in traversing curves.

The equalization of the two engines has been arranged to produce in effect a three-point suspension of the locomotive as a whole. On the front unit the equalization of all four drivers is continuous on each side and the two sides are cross-equalized with the engine trucks. The load on the frames of this unit is thus free to distribute itself over three fixed points of support, *i. e.*, the engine truck equalizer, fulcrum under the cylinder saddle and the rear spring hanger connection on each frame. The drivers on each side of the rear unit are also equalized continuously, but are not cross equalized, and so from two separate system, equivalent to two points of support of the locomotive as a whole, while the third point is provided by the front unit.

The Brake Rigging

Instead of dividing the brake rigging into separate systems on each side of the two units with an operating cylinder for each, the wheel base of each unit has been divided transversely into two systems of two pairs of wheels each. The space between the frames is too small to permit the location of the two cylinders side by side, and this arrangement of the brake rigging facilitates placing them at different points on the center line of the engine. On the front engine the cylinders are attached respectively to the frame braces back of the first and third pairs of driving wheels, which gives them practically identical positions in relation to their foundation gears.

On the rear engine the fact that the firebox extends forward over the third pair of drivers made it necessary to place the cylinder for the third and fourth pairs of wheels on the cross brace back of the second drivers. This required the placing of the brake lever fulcrum shaft for the rear half of the engine in front of the second pedestal jaws, from which the pull rods are carried back over the second brake bearer, above which they are broken in a horizontal pin joint and supported by a swing link hanger from the brake hanger bracket.

Two pull rod connections are provided on each cylinder lever fulcrum shaft, which are attached to equalizers, one end of each of which is attached to the forward brake beam and the other to a cross equalizer. From the center of the cross equalizer a pull rod leads to the center of the rear brake beam.

The brakes are operated by the Westinghouse E-T equipment and four 16-in. by 12-in. cylinders. Air is supplied by two 8½-in. cross compound pumps carried on the front end of the smokebox. The location and method of attachment are clearly shown in one of the photographs.

The principal dimensions and data are as follows:

General Data

Gage	4 ft. 8½ in.
Service	Freight
Fuel	Bituminous coal
Tractive effort (estimated)	135,000 lb.
Weight in working order (estimated)	575,000 lb.
Weight on drivers (estimated)	540,000 lb.
Weight on leading truck (estimated)	35,000 lb.
Weight of engine and tender in working order (estimated)	794,000 lb.
Wheel base, driving	17 ft. 1½ in.
Wheel base, total	54 ft. 8½ in.
Wheel base, engine and tender	97 ft. 3¾ in.

Ratios

Weight on drivers ÷ tractive effort	4.0
Total weight ÷ tractive effort	4.3
Tractive effort × diam. drivers ÷ equivalent heating surface*	736.81
Equivalent heating surface* ÷ grate area	101.41
Firebox heating surface ÷ equivalent heating surface,* per cent	4 7
Weight on drivers ÷ equivalent heating surface*	47.5
Total weight ÷ equivalent heating surface*	50.6
Volume equivalent cylinders with 90 per cent maximum cut-off	43.6 cu. ft.
Equivalent heating surface* ÷ vol. cylinders	260.0
Grate area ÷ vol. cylinders	2.6

Cylinders

Kind	Simple (two sets)
Diameter and stroke	30½ in.by 32 in.

Valves

Kind	Piston
Diameter	12 in.
Greatest travel	6 in.
Outside lap	2 in.
Inside lap	⅛ in.
Maximum cut-off	50 per cent

Wheels

Driving, diameter oveer tires	62 in.
Driving journals, main, diameter and length	12 in. by 16 in.
Driving journals, others, diameter and length	11 in. by 16 in.
Engine truck wheels, diameter	33 in.
Engine truck, journals	6½ in. by 12 in.

Boiler

Style	Belpaire
Working pressure	205 lb. per sq. in.
Outside diameter of first ring	96 in.
Firebox, length and width	168 in. by 96 in.
Firebox plates, thickness tube and combustion chamber connection, ½ in.; door, ⅜ in.; others, ⅜ in.	
Firebox, water space	5 in.
Tubes, number and outside diameter	137—2¼ in.
Flues, number and outside diameter	284—3½ in.
Tubes and flues, length	19 ft.
Heating surface, tubes and flues	6,125 sq. ft.
Heating surface, firebox	531 sq. ft.
Heating surface, total	6,656 sq. ft.
Superheater heating surface	3,136 sq. ft.
Equivalent heating surface*	11,360 sq. ft.
Grate area	112 sq. ft.

Tender

Frame	Rolled and cast steel
Weight	219,000 lb.
Wheels, diameter	33 in.
Journals, diameter and length	6½ in. by 12 in.
Water capacity	13,000 gal.
Coal capacity	14 tons

* Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.

Registration, American Railroad Association, Sec. III, Mechanical

Babcock, W. C., M. M., N. Y. C., Seaside.
Barnum, M. K., Asst. to G. S. M. of E., Baltimore, Dennis.
Barr, L. S., S. C. D., Live Poultry Transit Co., Strand.
Billau, L. S., Asst. Elec. Eng., B. & O.
Brady, C., E. C. C., Canadian Pacific, Fredonia.
Brangs, P. H., Dennis.
Burel, W. C., D. M. M., B. & O., Monticello.
Byers, R. F., Duffington.

Carson, G. E., D. M. C. B., N. Y. C., Dennis.
Clark, J. H., Supt. Float Equip., B. & O., Traymore.
Cole, F. J., C. C. E., American Loco Co., Marlborough
Colligan, P J., M. M., C. R. I. & P., Bothwell.
Conniff, P., Asst. S. M. P., Fla. East Coast.
Crawford, C. H., Gen. Engineering Dept., Marlborough.
Cromwell, Oliver C., M. E., B. & O., Strand.

Davis, W. P., M. M., N. Y. C., Haddon Hall.
Deems, W. A., M. M., Staten Island, Haddon Hall.
Deems, W. A., M. M., Staten Island Rapid Transit Ry.,
Diehr, C. P., M. M., N. Y. C., Fredonia.
Haddon Hall.
Dillon, S. J., M. M., Penn.
Dobson, F. L., M. M., Penn. Haddon Hall.
Doty, D. M., Inspr. Ord. U. S. N., American Road Machine Co., Strand.

Ennis, J. B., V. P., American Loco. Co., Traymore.

Gordan, H. D., Marlborough.
Graff, F. M., S. A. M. D., Erie, Shelburne.
Graham, Chas., Jr., Pennhurst.

Hainen, J., Staff Officer Mech., Southern, Dennis.
Hankins, F. W., M. M., Penn. E. L., Cheltenham.
Harris, H. Y., M. M., Tampa Northern, Westminster.
Hice, Geo. T., M. M., Morgantown & Kingwood, Monticello.
Hogan, C. H., A. S. H. P., N. Y. C. & H. R., Marlborough.

Jennings, Thos., M. M., B & M, Arlington.

Kight, H. R., M. M., Western Maryland, Monticello.

Lovell, Alfred, Traymore.

McDonough, John, M M., Santa Fe, Francis.
MacBrain, D. R., S. M. P., N. Y. C., Marlborough.
Marriott, F. I., C. D., C. & O., Alamac.
Maxfield, H. H., Works Mgr., Penn., Chalfonte.
Mellin, C. J., American Locomotive Co., Traymore.
Murray, F. H., Insp. Mech. Maint., Erie, Alamac.
Muchnic, C. M., American Locomotive Co.

Nanney, T. H., M. M., B. & S., Chalfonte.
Nelson, C. J., Genl. Car Insp., C. & N. W., Chalfonte.

Page, Charles N., M. M., Lehigh, Arlington.
Pidock, C. W., Pres., Georgia Northern, Chalfonte.
Porcher, Samuel, P. A., Penn.
Purcell, John, Asst. to V. P., Santa Fe, Shelburne.

Ream, A. H., M. M., Pitts. & Shawmut.
Redding, D. J., M. P. & L. E., Traymore.
Rhuark, F. W., M. M., B. & O., Pennhurst.
Riegel, S. S., M. E., D. L. & W, Runnymede

Schlafge, Wm., C. M. S., Erie, Shelburne.
Schmoll, G. A., S. M. P., B. & O., Marlborough
Smith, J. A., Middletown & Unionville.
Strauss, M. H., M. M., N. Y. C., Holmhurst.
Sweeley, E. A., M. C. B., Ry. Bd. of Adjustment, Lexington.

Trumbull, A. G., Asst. to C. M. S., Erie, Traymore.

Vaughan, H. H., Dominion Bridge Co., Marlborough.

Zeleny, Frank, Engr. Tests, C. B. & Q., Traymore.

Addresses by Distinguished Convention Visitors

Assistant Secretary of Navy Roosevelt, Senator Edge and Col. Hodge Tell of American Achievements in War

ADDRESSES BY ASSISTANT SECRETARY OF THE NAVY, Franklin D. Roosevelt, United States Senator W. E. Edge, of New Jersey, and Col. Henry W. Hodge, of the American Expeditionary Forces, were delivered to a large crowd of interested convention visitors on the Pier on Saturday night.

Secretary of the Navy Daniels had promised to come, but was prevented by important duties, and Assistant Secretary Roosevelt consented to come in his place. Senator Edge, who was governing New Jersey during most of the time the country was at war, lives in Atlantic City. Colonel Hodge was connected with the engineering work of the American army in France, and for a time was in the transportation department under General Atterbury.

Arrangements for the meeting were made by the Entertainment Committee of the Railway Supply Manufacturers' Association, and E. H. Walker, president of the association, presided and introduced the speakers.

In opening the meeting, Chairman Walker said: It is three years since we have met in convention, and during that time we have seen a world remade. We have seen nations regenerated into serious, glorious manhood. We have seen this nation changed from indifference into passionate devotion. We have seen cynicism changed to patriotism; luxurious self-indulgence transformed into a fine abnegation; individual character exalted by a common cause.

When this nation decided that it could no longer be neutral between right and wrong, and there was a call to arms, two hundred thousand men went from the railroad ranks into the uniformed ranks, and as many more from the railway supply manufacturers' mills, foundries and desks.

To these men we meet to do honor; but not only to them, but you also, who served in civilian clothes, and in dungarees back of the lines, because this war was not won alone by burnt powder and shot and shell.

Address of Hon. Franklin D. Roosevelt

Secretary Roosevelt said, in part:

Unfortunately, from the point of view of a good many people in the naval service, the primary purpose for which a navy had been thought to be created, of going out and fighting an enemy, was defeated because no enemy would come out to fight us. And so our task fell to fighting an invisible enemy. Our task fell along the same lines as your tasks fell—to throw ourselves heart and soul into the great game of winning the war where the enemy was; that is to say, on the soil of Belgium and France and Italy.

We, with you, were merely one link in that great chain that brought about the ultimate victory, because that chain started in the factory town in this country. It started on the farm, and the first link in the chain of transportation was composed partly of the material which existed, of the steel rails, the locomotives and the cars; but it existed far more in the personnel that made possible the operation of those material things. It was through the co-operation of the individual, not so much of a few people at the top in the railroads, in the Navy, and over in France, but in the individuals who made up the great mass of the servants of the Nation; who made the locomotives run, and the car wheels go round; who made the ships cross the ocean, and who protected them across the ocean; who took the supplies and the troops off in France, and then another railroad organization took them up to the fighting front. That was the chain that made it possible for the men in the trenches to do their part.

I think it is fair to say that in handling the work of the supply department of the Navy we earned the good will of the men that we did business with, because we met them, or at least tried to meet them, on the level. The first principle which I presented two months before the outbreak of the war was this: We were going to increase the purchases for the Navy Department many hundredfold, and I saw signs at that time of other branches of the government trying to go out and do something new with new tools. And I said "No." In the purchase of our sppplies, I believed it to be the right principle that we should take the men who know about supplies to assist us, and go to them first. In other words, we did not try to ask watchmakers to give us 14-inch shells; neither did we ask people who turn out armor plate to make chronometers for us.

So far as possible, the Navy tried to develop existing plants. That system proved its wisdom, and the result is that, so far as I know, the Navy happens to be one of the few departments of the government that is not under serious investigation at the present time I think the country, as time goes on, will begin to recognize the magnificent spirit of service of the quarter million of men who went into the uniform from the railroads, and probably an equal number of men who went into the uniform from the railway supply organizations all over the country—a total of probably half a million men, who were trained in the work that you have been trained in. That half million men, plus the Navy, were responsible for getting the munitions and supplies to the troops from away back home, up, yes, to the Rhine. We appreciate it in Washington. I do not need to tell you that.

Address of Senator Walter E. Edge

Senator Edge said in part: I think it is a magnificent tribute for you men and women to come to this hall tonight and spend an hour in consideration of those who have been associated with you in business, who offered their services to their country in the time of war. We could not all go abroad. We should not have all gone abroad. There were many responsibilities here, and it was a wonderful inspiration to see the way the men and women of New Jersey—and that simply typifies the sentiment of every State in the Union—met the obligation, and the way they were ready and determined to do their full part as members of the home army.

We must appreciate right now that we are facing the greatest problems this country has ever faced; problems that must be solved by sound, careful and mature judgment, and without sensation or too much visionary thought, and adherence to too many ideals in trying to reach the solution of these problems. I do not propose to discuss any of these problems, particularly the position of our country in the League of Nations. I do not want America to evade any responsibility. As we all know, she was a very potent factor in winning the war, but at the same time we must not evade any responsibilities in endeavoring to maintain the position she so dearly bought.

But with all that, I feel that this country can be stronger and better able to meet this great new and broadened responsibility, now that we occupy practically a position at the head of the council table of all the nations of the world. Under these circumstances, we can be stronger and better equipped to meet and help solve these problems by maintaining, at least, the sovereignty that has made us great, and although I want to see this country do its full part in any League of Nations or any other combination of nations, which will help to maintain peace, yet I do not want to see her as a minority stockholder in any international corporation.

We must forget everything but the duty we owe to protect the Flag, and back up the four million boys who went into the service, and now that we are trying to solve the problems before us, I propose to stand for the principles which actuated us in our part in the war, in order that the sacrifices we have made will not be in vain.

We have decided in the Commerce Committee, of which I am a member, that we will spend $25,000,000, in

Senator Walter E. Edge

order that we may build a merchant marine, and some of us are trying to decide what we are going to do with it after it is built. I want to see a splendid merchant marine, carrying the American flag on all the seven seas. I want to see the men now employed in shipyards continue in that industry, and do not want to scrap the terribly costly equipment put in during war times on the Atlantic Coast.

But I want to go a little further, and find out if we are to be paid by the European countries for the manufactured products, the engines and tenders and machinery which we sent to France, and also to other countries. We can get the merchant marine readily, and we can get orders by the thousands, but we cannot get paid for them under present conditions. I want this country to prepare now, in times of peace, as in times of war, so that we can finance our credits and buy securities abroad, and bring them back here, and use their credit against our credit, so that they can pay us for the commodities and products that we send abroad. We desire that the government will co-operate and back your business with the credit of the country in a way that will enable you to push your business ahead, with the understanding that the government will back you in securing your payment for the business which you secure abroad.

There is a great difference between the government running your business and the government giving you the moral and financial backing—and with the backing

Colonel Henry W. Hodge

of the American government, with its almost inexhaustible resources, we can go ahead and expand our business in all parts of the world, and that is the basis on which some of us are working.

Address of Colonel Henry W. Hodge

[Chairman Walker, in introducing Colonel Hodge, said: The transportation department of the American Expeditionary Force achieved marvels. Many things which the French and British war chiefs claimed were impossible were accomplished sometimes so easily as to intimate magic. Colonel Hodge was in France even before General Atterbury, and was with the General after he arrived. He was then made the Manager of Roads, and finally Assistant Chief Engineer of the American Expeditionary Force in France; he traveled over 28,000 miles in his automobile, back and forth, from Dunkirk to the border of Switzerland, and up and down the Coast, with all of what that means to the observant man, with the trained eye. He is going to tell up some of the things our boys did over there, and some of the things he helped do himself.]

I do not think that we have a true perspective of what has been going on in France—we do not know the size of the job. We all know we had two million men in France, and we thought that the most of these two million men were in the front line trenches. They were not. There were never more than 435,000 men at the front, out of two million men, and that is about the usual percentage in any army; in other words, in the Army you have four men back of the lines supporting every man in the line. But do not think that the rest of them, the one million six hundred thousand, were not fighting—they

were fighting, by doing work that the men in the front lines could not do.

At one time we had over 100,000 men doing engineering work, building railroads, docks, telegraph and telephone systems, building the biggest storage yard the world has ever known, building locomotive roundhouses, automobiles, refrigerator plants—the latter, the biggest on the face of the earth—and all these things being provided for the maintenance of our two million men whom we had in France, and we did the work pretty well.

We had the greatest transportation problem the world has ever faced. Our Allies did not have any problem such as we had. The British occupied the ports of Havre and Calais, and the average haul from England to their front lines was about 75 miles. The French had their supplies immediately behind the lines all the time; they had their shops and all their equipment behind their lines, and their haul was not more than 35 or 40 miles. We had to haul our stuff half way across the United States and 3,000 miles across the sea, and land it in France; and perhaps you think when it was landed in France all our fellows had to do was to fall on it and eat it. No, it was not as easy as that. We then had 600 miles to transport it, and we did transport it that distance.

When we got in France, we Americans were as green as green could be about the transportation problem. We did not know how much material we had to transport. They sent several of us up to the British and French headquarters to find out what heir transportation problem was, and we discovered that the British were hauling 50 lb. per man per day and the French were hauling 47 lb. per man per day. That means everything, food, munitions, equipment, fodder, and everything else that is required by an army. That does not seem much to you, perhaps, but when the Armistice was signed we were handling 53,000 tons of freight every day from our own ships. We were unloading every day 20 ocean steamships—literally every day, weekdays, Saturdays, Sundays and holidays.

Our great problem when we arived in France was to find out how we were going to do that. When we got there the British were occupying the two main ports on the Channel. They really had possession of all the available ports, and when we asked the French and British if there were any of the ports that we could use, they did not seem to be able to give us any reliable information.

Building a Port

The first thing we did was in August, 1917, when there was no American Army in France. That was to select a site for our first port. We picked out the port at Bassens, near Bordeaux, and when I was there for the first time, in August, 1917, it was a slimy mud bank, with a large swamp behind it. We took it as the best place where we could build a port because we had deep water up to the very front of the location, a good piling bottom. We found we had nothing to start with, and we asked General Pershing if we could borrow material from the French, and he said: 'We came to help the French, and not have the French help us. You must get your materials elsewhere." We cabled to the United States, and we got big lumber from Oregon and Florida, and we got pile drivers and cranes from the United States, and we got generators to generate electricity to run the trains, and American operators to operate the trains and we started in with about 13,000 men. Inside of 10 months we turned a swamp into docks for 10 ocean-going ships, and handled 25 tons of freight per day every day.

Then we started on other ports, and after we got these ports, we had to take care of the stuff that came in. You may think we had a supply of common labor in France. I went across on a ship with two engineering regiments, and on the way over these 5,000 men were constantly talking about the men who were to do the labor on the job they were going to be the brains for. One of the officers said: "Is there much labor in France?" My reply was: "Not that I know of, but there are 5,000 good laborers aboard this ship." He replied, "We are not expected to do the labor, we are the brains of this organization, and someone else is going to do the labor."

The first job I was assigned to was at Bassenes. As I came across the swamp I saw the Colonel of the regiment, and the 2,500 men stretched out in a line, hip deep in mud, shoveling up the mud on to the bank; he waved his hand to the long, hard-working set of men and said—"behold the fate of a college graduate." As we got further down the line he stopped opposite a nice-looking boy, perhaps 20 or 24 years old. He said, "You see that boy with the long handled shovel—his father is one of the richest men in San Francisco. He wanted a commission and could have had it, but he did not wait for it, and joined as a private." He then said to the boy, "Walter, how is it?" The boy wiped the perspiration off from his forehead and said, "Colonel, I passed three examinations to get this job."

Building Yards the Next Step

That was the class of laboring people our railroads had there. After we got through the building of the railroads, we went to build yards. We had freight coming in at the rate of 50,000 tons a day, and we had to build yards to accommodate that freight. We laid out our first yard in the center of France, 8 miles long and 4 miles wide, and we had 125 miles of ladder tracks, and between the ladder tracks we had warehouses. The General came to me in August, 1918, and said, "Hodge, can you write a cablegram to be sent to the United States, describing the character of storehouses that you will require?"

I then wrote the following: "We want storehouses fifty feet wide, 11 feet high, at the eaves, built of wood or iron frame. Length immediate required 25 miles." That was the cablegram for the first order of warehouses, and we got it. That is the style we went into. We did it on grand scales.

When we first took that yard drawing up to the Army headquarters, they said, "We never would think of using a yard like that. We don't need it. We are here to fight a war, not build warehouses." But before the armistice was signed, we had six yards like that.

After we got the yards built, we had to commence building roads, to get stuff up to the front. Perhaps you might think we could take our stuff up to the front on railroads. We could not. We took it up to within about 15 or 16 miles of the front, then we took it the rest of the way by motor trucks, and the War Department says we had 16,000 trucks. Perhaps that is so. We did, but we didn't think so, we never saw them. They were great roads, not roads like the ordinary country roads. They were 80 feet wide and had rock on them three or four feet deep, because we had to get a good bottom in that muddy country; and we re-surfaced them all the time, the motor trucks wearing about 3½ in. of rock off every month. We had to employ about 36,000 men in keeping those roads in order, but that was not enough, we could not keep the roads up.

Well, our road work commenced in the Chateau Thierry drive. We were told this drive was coming and were told to carry rock, a total of 40 or 50 thousand tons, to build roads. That doesn't seem much to you because you could go to the telephone any day in our big

cities and call up a few quarries and they would furnish you all you wanted, but you must remember that in France we had nobody to telephone to, and if we needed the rock we had to dig it out and crush it and carry it ourselves.

So we opened 42 quarries, one up on top of a hill up on the Marne. It was 240 feet above where the trench was; it had never been opened. "It was good stone," the French said, "but rather expensive to get it down." And they did not think we could do it; they stood in open-eyed wonder when we hauled two big 45-ton Marion steam shovels up the hill, for we hauled them with beef, man-power, and block and tackles. Then we did not have any ordinary drills, we had only 8 in. well drills, so we drilled holes and loaded them with TNT and ordered the men off into the next county until we fired, and what did not land in the next county we picked up. There was six or eight thousand tons after we fired those shots. Then we tumbled it into the crushers on top of the hill and brought it down to our cars at the bottom of the hill, and within five days after we started that work we were getting five or six hundreds tons a day, and there wasn't another quarry in France getting fifty tons out.

The Bridge Work

Just one thing as to the bridge work we did. The bridges were generally very simple, but most of the work in the Argonne fight was pontoon work, and we didn't have an American pontoon over there.

We Americans did wonders. You people at home did wonders. You sent us all the ammunition and clothing and many other things, but you don't want to ever accept as true the statement that an eminent late statesmen used to make that a million men could rise to arms over night. A million men could rise to arms, but they are not an army, they are not equipped with lots of the things we need, but could not make in time for use in this war.

To begin with, we did not have any artillery in France. I was taken up by one of the Army officers in that statement. He sent me a list of 57 guns we had. Well, what is 57 guns? We did not have any aeroplanes to speak of. We had a lot being assembled but they were not on the front. The gas masks and helmets we fought with were almost entirely British, and so also were a lot of supplies. We had to get hem from our Allies, and they furnished them to us.

Among other things we did not have any pontoon boats; we had to cross the rivers, and the Chief Engineer said: "Now, you are in charge of the bridges. It is up to you to know where things are and to get them." And I did get them, because I found out the Germans had come to the Marne with the greatest pontoon equipment the world has ever seen. They had come with 183 boats, better than the U. S. Army had ever seen.

Somebody said, how do you know they had 183 boats. I know it, because after they had been shelled for three weeks, they had the experience and we had the boats and we needed them. We took a gang of men up along the Marne and pulled those boats out of the bottom of the Marne mostly, filled with dead Boche and holes. We did not care about the dead Boche, but we did worry about the holes. And we had some trouble patching up those holes and making timber structures, but we got them fixed up, made them sound, and used them to chase the Germans in their own boats. And when we got one of the bridges up I saw some of the boys were very busy at a certain spot, near the end of the bridge. I went and looked to see what they were doing, and found they were placing a sign, and it said: "Made in Germany but erected by the U. S. Engineers."

If anybody asks you who won the war, and there is any question about it, it was not General Pershing; it was not the general staff; and not the officers; it was nobody in the world but those same dead boys in olive drab that won the war. And it was a job well done. But we don't want to give way to the feeling that we did it all. We want to be a little bit careful not to give way to the American feeling that we are the whole thing.

When we look carefully at the war, we, the Americans, only fought two campaigns. We fought the Chateau Thierry campaign from Soissons to Rheims, which is a distance of 27 miles, and took us two months. Then we moved to Argonne and we fought from Verdun to Vincennes, a distance of 50 miles, and it took us two months. Therefore, we were fighting on a front of eighty miles, for a total of four months, and our total losses were about 80,000 killed, and total casualties 300,000 men. That is a lot of good American boys, and we are sorry they are lost, but when we compare that with our allies, who fought 4½ years, on a front of 450 miles, and had total casualties of nearly 7 million men—then you can't look them square in the eye and say we did it all.

The meeting was preceded by a dinner given by President Walker, of the Supply Manufacturers' Association, at the Shelburne, in honor of the visitors. Those present were Mr. Walker, Assistant Secretary Roosevelt, Ralph Coburn, who was a college classmate of Mr. Roosevelt; Senator Edge, Colonel Hodge, C. E. Chambers, W. J. Tollerton, E. Hoover, E. H. Bankard, J. E. Fairbanks and Samuel O. Dunn.

The Army Ordnance Exhibit

THROUGH THE COURTESY OF THE ORDNANCE DEPARTMENT of the United States Army, the American Car & Foundry Company has a group of three ordnance exhibits, one of which is on the pier and the others outside. The outside exhibit consists of four heavy artillery pieces on railway mounts and an ammunition car, which are on the Mississippi Avenue tracks, and an exhibit of field artillery trucks and artillery repair trucks, which are parked near the Boardwalk, just north of the Marlborough-Blenheim. An exhibit of shells is located on the pier.

The four heavy artillery pieces in the track exhibit are a 14-in. rifle, a 7-in. rifle, a 12-in. mortar and an 8-in. rifle. The 14-in. rifle is mounted on a heavy built-up frame of deep girder section, which is carried on two eight-wheel trucks. This rifle can be elevated to any angle up to 45 deg., and has a full traverse of 360 degs., with a range of 20 miles. The mount, ready for service with the gun in position, has a total weight of 436,700 lb. The eight-wheel trucks are completely equalized on each side with semi-elliptic springs over each journal box. The axles have 6-in. by 11-in. M. C. B. journals. The truck frames extend out beyond the ends of the gun mount, and are of such a height that the coupler and draft gear are mounted on the ends of the frames.

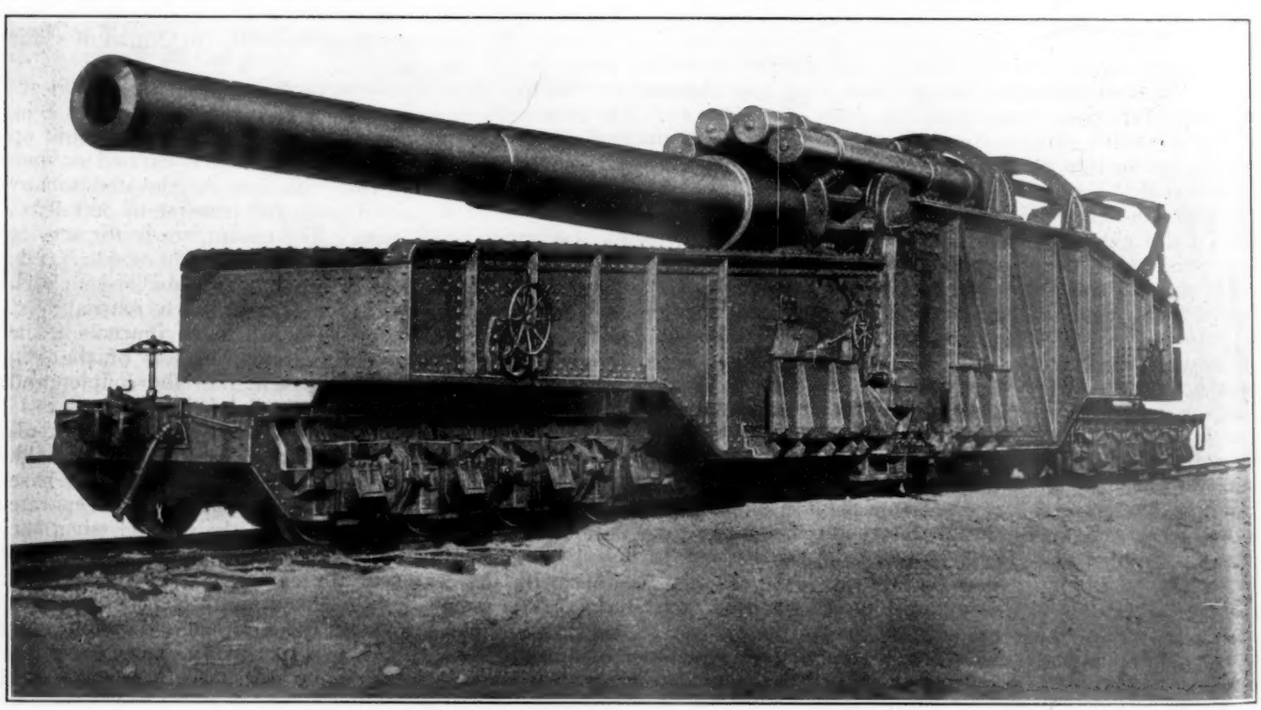
This mount is essentially for coast defense work, although its mobility makes it available for use in the field. The gun is not traversed when on the trucks. A base ring with a conical roller path is carried on a separate car, and is set on a foundation in the ground when the gun it to be put into action. The car is run over this ring with the center of the car over the center of the ring. The mount is then jacked up, the trucks removed, and the mount let down on the base ring. The gun may also be fired from the trucks, but at a reduced elevation of 22 deg. This mount is the only one of its type which has so far been built.

The seven and eight-inch rifles and the 12-in. mortar are all carried on mounts of the well type, and the two rifle cars are carried on trucks of standard railway type. The rifles are both mounted on barbette carriages, having a full circular traverse. The 7-in. rifle has a range of elevations from minus five to plus fifteen degrees, and the unit complete weighs 160,000 lb. at the rail. It is carried on standard 50-ton trucks. These outfits were designed for coast defense purposes and were used as protection against submarines. The 8-in. rifle has a range of elevations from horizontal to 42 deg. and weighs 174,000 lb. on the truck. The trucks of the 8-in. rifle are the standard 70-ton truck.

In one of the illustrations is shown the method of bracing the car when the gun is in service. To place the piece in action the mount is freed from the trucks by means of jacks which form an integral part of the car body, are are lowered by means of these jacks to rest on crossties placed on the rails. Outriggers, pivoted to the car body and carried against the side of the car when not in use, are swung and braced against suitable foundations, arranged as the angle of traverse requires. It is said that a trained crew can place these pieces in action in about 20 minutes.

The 12-in. mortar mounts are carried on six-wheel trucks, fully equalized, the frames of which are of

Railway Mount with 7 Inch Army Rifle



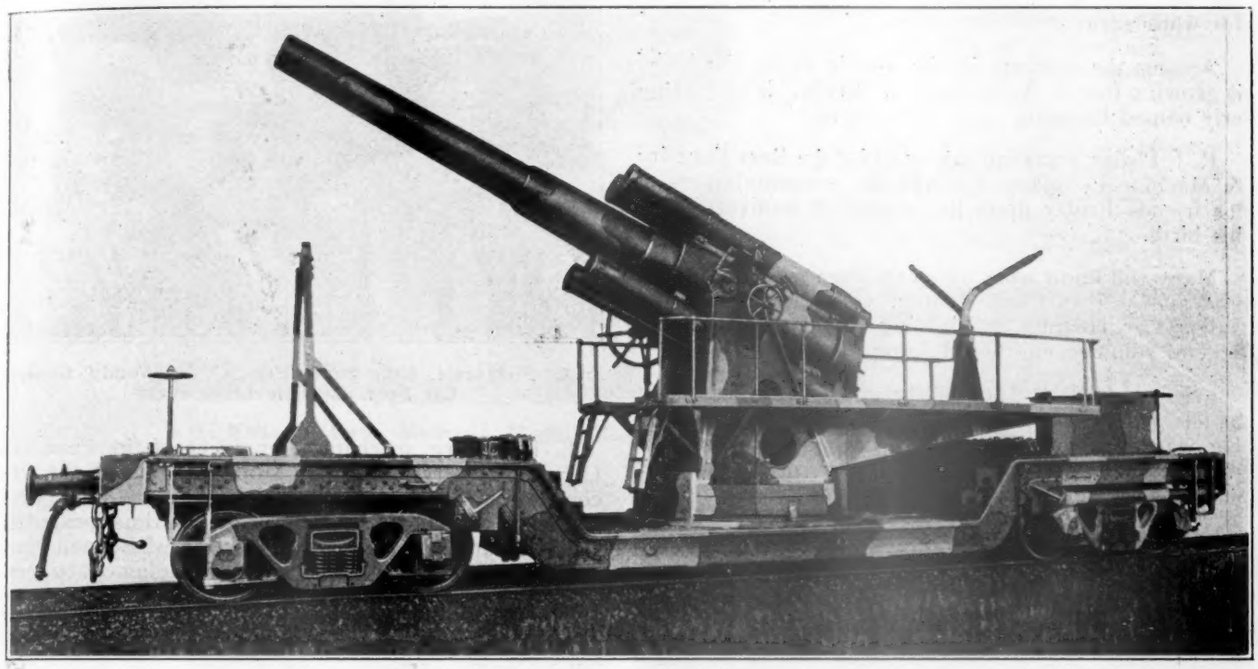
Railway Mount with 14 Inch Army Rifle for Seacoast Defense

special built-up construction. The mortars have a complete circular traverse and a maximum elevation of 65 deg. The mount with the gun ready for service has a total weight of 180,000 lb. This is essentially a field piece and is intended principally for destroying deep underground fortifications.

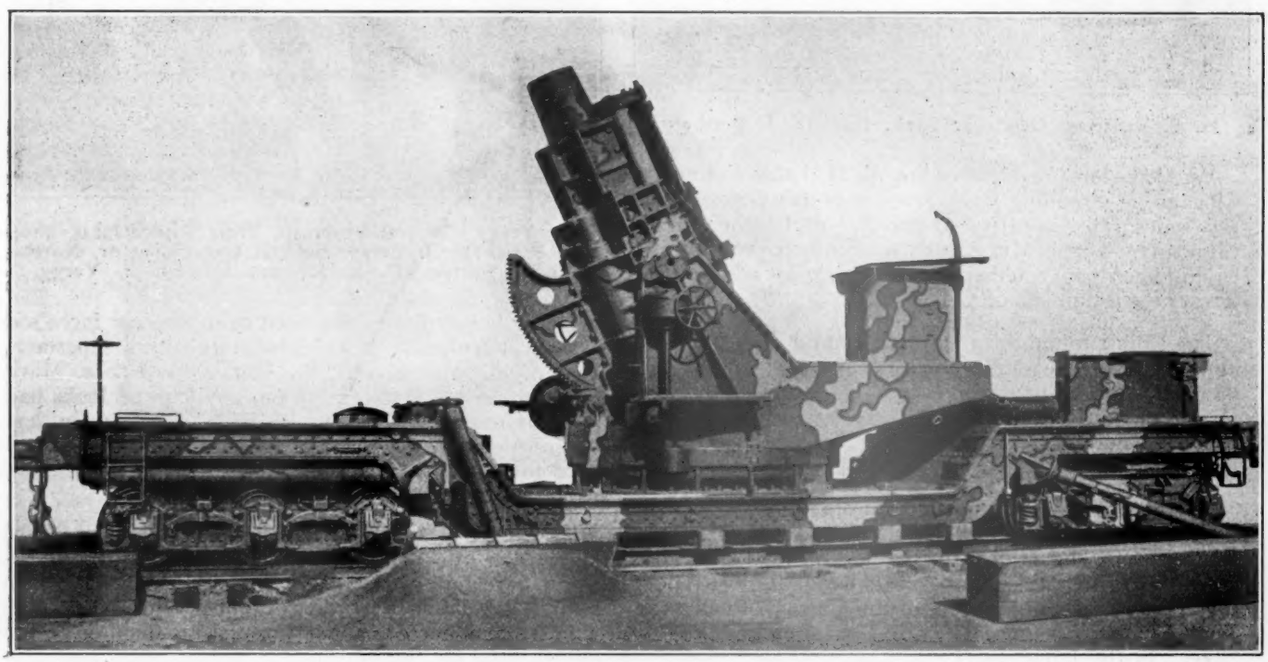
The 8-in. rifle and the 12-in. mortar mounts are equipped with the French type of screw coupling and buffers.

The armored ammunition car is designed for railway artillery equipment and has a capacity of 66,000 lb. In the design of the body and the underframe structure, this car follows closely the box cars built by the American Car & Foundry Company for the French Government. The interior is equipped with ammunition racks and a longitudinal trolley hoist. Doors in the end of the car permit the hoist beams to be extended outside the car for the purpose of serving ammunition to the gun.

The field artillery exhibit includes a caisson limber and carriage limber for a 77-mm. field piece, a powder and store wagon, forge and store limbers, a 4.7-in. gun and gun caisson, and a 75-mm. field gun and tractor. A number of artillery repair trucks are also included in the exhibit. With the exception of the 75-mm. field gun and tractor, these units were all built by the American Car & Foundry Company.



Railway Mount with 8 Inch Army Rifle in Position Ready for Firing



Railway Mount with 12 Inch Seacoast Type Mortar

Conventionalities

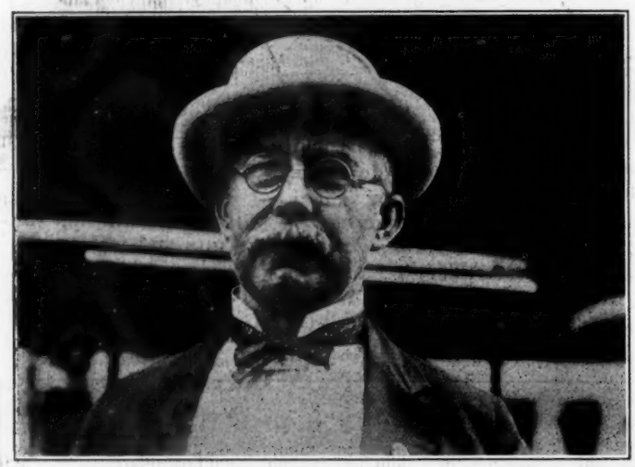
J. R. Sloan, chairman of the committee on train lighting and equipment, says that Altoona, Pa., is no place for white serge.

Among the workers in the supply ranks the belief is growing that E. A. Le Beau, of "Creco," is very properly named Earnest.

R. J. Fisher, traveling salesman for the Bass Foundry & Machine Company, received the congratulations of his friends Friday upon the seventieth anniversary of his birth.

Many will know what we mean when we say that it is understood that Clark Moore, vice-president of the Safety Car Heating & Lighting Company, is writing several volumes, entitled "Life on the Pacific Coast."

Friends of W. A. Hall will be interested to learn that he left Yale & Towne to enter the navy in March, 1917. He was only recently released from service and has joined the Cleveland Tractor Company's organization as manager of industrial sales, at Cleveland, Ohio.



H. S. Fentress, Gen. Car Insp., Norfolk & Southern.

W. M. Lalor, president of the W. M. Lalor Company, Chicago, is attending the conventions this year as railway sales representative of the Zapon Leather Cloth Company. This is Mr. Lalor's sixteenth convention, he having been connected with the electric car lighting interests for a number of years.

The Editor found this memorandum on his desk a few minutes after the dailies were delivered on Saturday morning: "My name is Harry D. Vought and not Harry D. Wright, as reported in the account of the Railway Club Secretary's meeting in Saturday's *Age*. Bang that proofreader!"

To the list of members and guests who have taken trips in aeroplanes over Atlantic City during the conventions may be added the names of Mr. and Mrs. Harry Vissering and James A. MacLean. Latest report says that President Jackson, of the Chicago Pneumatic Tool Company, is to take, or has already taken, a "flyer" in the latest sport.

Many railroad and supply men are expressing their feeling in the loss by death of Secretary Joseph W. Taylor, of the M. C. B. and M. M. Associations. The passing away of Mr. Taylor, suddenly and unexpectedly, in the midst of his activities meant a loss which time will hardly repay.

L. C. Fitzgerald, Shop Supt., Erie; G. N. Waddy, General Car Foreman, Erie Lines West

E. R. Viberg, mechanical engineer of the Canadian Car & Foundry Company, Montreal, missed the 916 convention because of being sent to France in connection with war supplies. He was at one time located at Camp Audrie, to assist in the erection of Belgian cars, and while there heard the incessant booming of artillery.

J. P. Yergy, General Foreman, West Philadelphia Shops, P. R. R.; H .J. Yergy, General Car Inspector, Northwest System, P. R. R., and Mrs. J. P. Yergy.

Never before have there been so many new faces seen at the convention. T. A. Foque, mechanical superintendent of the Minneapolis, St. Paul & Sault Ste. Marie, is attending his first convention. When one looks back at the remarkable work that he did as secretary and later as president of the old Northwest Railway Club, it is hard to believe that he could have kept away from the Atlantic City conventions as long as he did.

The limit of space on the pier worked severe hardship upon one firm which shipped a carload of material here but were unable to get space. The Computing-Tabulating-Recording Company, of New York, would have made a most interesting display of machines used by the accounting departments and illus-

trative of the advantages their use may give in tabulating details in the mechanical department records. Harry S. Evans is representing the company here.

Captain R. de Heidenstam, of the Gas Accumulator Company, Stockholm, Sweden, has recently arrived in this country and is attending the convention. His company represents the Dalen patents, covering gas lighting of railway signals, grade crossings, buoys, etc., and he is in this country studying American conditions. Captain de Heidenstam expects to remain another two months and is making his headquarters at the offices of the American Gas Accumulator Company, Elizabeth, N. J. The captain expects that a very large portion of supplies of all kinds bought from Germany or through German export houses prior to the war, will in the future be ordered from the United States and England.

J. T. Mallard, Master Mechanic, Norfolk Southern.

Frank W. Edmunds, of the Schroeder Headlight family, had to return home last Friday to function as president of the School Board at West Nyack, N. Y., at the graduating exercises. Mr. Edmunds has taken a personal interest in educational matters in his neighborhood and has been responsible for many school improvements. During his absence, his co-workers have hung his "convention service" flag in the Schroeder booth, on which are thirty-seven stars and the following words: "The old war horse, 'Pop' Edmunds. Convention service flag record—a star for each year, count them—still going strong." Mr. Edmonds returned yesterday.

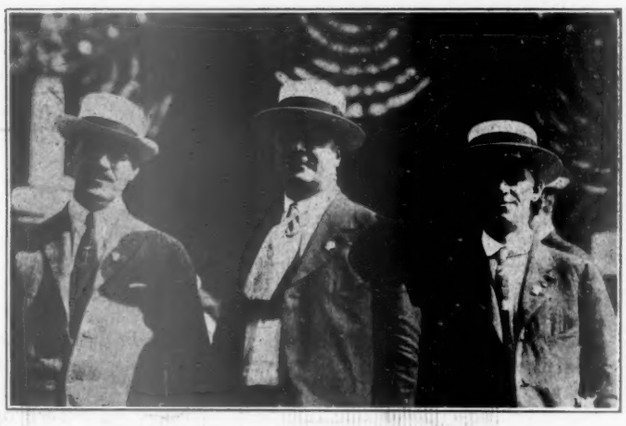
Alas and alack! There will be no golf tournament this year. Many will be disappointed. Have you heard

THE GOLFER'S PRAYER

O Lord, I pray Thee for a drive
Of such a length that I,
In telling of it afterward,
Shall have no cause to lie.

And this will amuse some of us:

There was an old duffer who stood
For a slice, as he aimed at a wood;
But by some twist or crook
He came through with a hook,
And the little pill left him for good.



Left to Right: George Thomson, Master Car Builder, N. Y. C.; I. W. Senger, Master Car Builder; N. Y. C.; E. H. Trottnow, Assistant General Foreman, N. Y. C.

The Fuel Conservation Section of the Railroad Administration is represented at the convention by three regional fuel supervisors, all of whom have been presidents of the Traveling Engineers' Association or the International Railway Fuel Association. They are: F. P. Roesch, of the Northwestern region; L. R. Pyle, of the Central Western region, and B. J. Feney, of the Southern region.

Left to Right: H. F. Grewe, Master Mechanic, P. W. & B.; C. B. Keiser, S. M. P., P. R. R.; O. S. Jackson, S. M. P., C. T. H. & S. E.; C. Bowerson, M. M., Toledo & Ohio Central; F. K. Moses, M. M., B. & O. Chicago Terminal; C. M. Hitch, M. C. B., B. & O.; E. H. Mattingley, General Car Foreman, B. & O.; J. S. Naery, M. C. B., C. I. & L.; J. F. Holzemer, Purchasing Agent, Toledo & Ohio Central

New Devices Among the Exhibits

New Machine Tools and Shop Devices

COMPARATIVELY FEW NEW TOOLS or shop devices for railroad use were placed on the market during the war. The builders were kept busy making their standard machines or in devising equipment for the manufacture of war supplies and munitions. That the designers were not unmindful of the demands after the war is evidenced by the number of new designs which have been placed on the market during the past few months. A large proportion of the new tools and shop equipment suitable for use by railways was fully described in the June number of the Railway Mechanical Engineer, subscribers to which are receiving copies of the *Daily*. We shall therefore in this article attempt only to briefly call attention to the new machine tools and shop equipment devices that are exhibited on the Pier and which were described in the special Shop Equipment Number of the Railway Mechanical Engineer in June.

High Power Multiple Spindle Drill

An interesting example of drills of this type is being exhibited by the Defiance Machine Works Company of Defiance, Ohio. A description of it will be found on page 358 of the June Railway Mechanical Engineer. It is a heavy service production tool, especially intended for use in locomotive and railroad shops and will be found useful whether the work involves heavy gang drilling or heavy jig drilling. On jig work the compactness of the machine enables one operator to keep a number of spindles—either singly or in groups—in operation, and as a result, the operator is kept constantly reloading the jigs. One of these drills is in the exhibit of Manning, Maxwell & Moore.

The Ohio Tilted Rotary Milling Machine

That there is apparently no limit to which the designer will go in the search for the practical application of every possible principle which will influence the efficiency of machine tool production is strikingly illustrated in the tilted rotary milling machine which is on display in the booth of the Osterlein Machine Company, Cincinnati, Ohio. As implied by its name, the table on this machine revolves, carrying the work to the cutting position; during the cutting operation the finished work is removed on the opposite side of the table, and the new work is set up. The cutter may be held in a fixed position and the table rotated continuously by automatic feed for continuous milling, or the cutter may be reciprocated radially in combination with an intermittent motion of the table, controlled by an indexing mechanism which provides for from two to 72 divisions. The table revolves rapidly between divisions in order to reduce the idle time, and by feeding the cutter radially over the surface of the work the loss of time between milling surfaces is avoided on such jobs as cannot be compactly spaced. Other advantages in the design of this machine include the avoidance of non-productive time of cutter approach. The cutter travels the shortest possible distance. Two or more simple fixtures may be used instead of one large fixture, and the machine is practical when applied to small quantity lots. This machine was described in the June Railway Mechanical Engineer, page 360.

The Mult-Au-Matic

Friends of the quantity producer, the Bullard Mult-au-matic, manufactured by the Bullard Machine Tool Company, Bridgeport, Conn., will be interested in noting the refinements and changes which have been made in the 1919 model of this machine. The new model is shown in operation on the pier. A detail description of it will be found on page 394 of the June issue of the Railway Mechanical Engineer.

Internal Grinders for the Locomotive Shop

In repairing valve motion levers, parallel rods, and various similar parts where the holes in the rods or in the bushings are worn oblong or rough, or the holes in the levers have become distorted, the use of the internal grinder commends itself. Those who have benefitted by their recognition of the cylindrical grinders' place in the locomotive shop will be interested in the machine displayed by the Heald Machine Company of Worcester, Mass. It was described on page 362 of the June issue of the *Railway Mechanical Engineer*. It combines several noteworthy features, among which may be mentioned a large crosswise adjustment for the work, large vertical adjustment of the knee, multiple speeds for the rotation of the head, quick change gear boxes for speeds and feeds, and micrometer readings throughout.

Belt Type Finishing and Buffing Machines

These machines embody the principle of a two-belt system employing an abrasive cloth belt running at high speed over a heavy corrugated leather cushion belt. Without memchanical holding devices or power feed attachment the work is held by hand, and produces a finished product of a superior nature. Equipped with a holding device and the power feed attachment, the machine is automatic in its operation, and thus production is limited only by the ability of the operator to handle the work. They are being exhibited by the Blevney Machine Company, Greenfield, Mass., and were described on page 345 of the June Railway Mechanical Engineer.

Automatic Screw Cutting Die Head

The thread chasers on the new Landis automatic screw cutting die head may be easily and quickly removed for grinding or changing, as they are supported on the face of the head. The head is opened automaticall by retarding the forward motion of the carriage, is closed by hand, and is locked by the operating handle which contains a latch having a tongue milled on the lower end. This tongue is milled off center, which permits roughing and finishing cuts; to adjust the head for either merely requires a half-inch turn of the latch to a suitable graduation. It will be found among the other products in the exhibit of the Landis Machine Company of Waynesboro, Pa. It was described in the June Railway Mechanical Engineer, page 372.

Constant Speed Motor Drive for Shaper

A "selective type" gear box, with steel case-hardened gears, which may be used with a constant speed motor drive or a single pulley belt drive giving the same changes of speed as are ordinarily obtained with the

cone pulley drive, has been designed by Gould & Eberhardt, Newark, N. J., and is being exhibited mounted on one of their 28-in. Invincible shapers. By the use of this device it is unnecessary to stop the machine in changing speed except when changing from single gear to back gear, or vice-versa. The application of this device was recently described in the Railway Mechanical Engineer for June.

Combination Punch and Shear

The combination punch and shear exhibited by the Beatty Machine & Manufacturing Company, Hammond, Ind., is especially designed for steel car repair work, and combines some interesting features, noteworthy among which is the provision for three different sizes of punches which can set up simultaneously and be operated independently of each other. One end of the machine is built as a guillotine frame of semi-steel and supports and operates three different types of shears:: one for flat work, one for different sizes of round bars, and another for angle irons. The extreme right end of the machine contains a set of coping tools. Seven sets of tools, each set ready for instant use, constitutes the working range of this interesting combination. The machine was described in the June Railway Mechanical Engineer, page 396.

Motor Driven Double Holder Drill Grinder

Those who seek "more holes for less money" should be interested in the motor driven double holder drill grinders which have been brought to the convention by the Grand Rapids Machine Company, Grand Rapids, Mich. One of its style C-6-A grinders, which was described in the June Railway Mechanical Engineer, is on display with several models of other types. The C-6-A grinders combines a small minimum capacity convenient in handling small drills with the necessary capacity for large drills. The small holder will accommodate drills from No. 52 to ¾-in., while the larger one will handle drills up to 4 in. or more. The larger holders grind the large drills wet and use a coarse wheel. The small drills are ground dry on a fine grain wheel. The rotation of the wheel of this machine is downward from the point of the drill, which not only obviates a tendency for the drill to lift from the holder, but throws all grit downward, resulting in safety for the operator's eyes.

A Valveless Air Drill and New Shipping Hammer

Because of the elimination of the delicate valve mechanism, the valveless air drill which is being exhibited by the Keller Pneumatic Tool Company of Grand Haven, Mich., is exceptionally light and compact. Economical air consumption is claimed for it, and it is stated that it will stand up under severe service. These machines are built in the non-reversible or reversible types, including a reversible wood boring machine and a reversible grinder.

The company is also exhibiting the new type of pneumatic chipping hammer, which it calls the Sure-Lox, a name derived from the manner of locking the handle to the cylinder, which eliminates the old-style clamp bolt. The new handle of the Sure-Lox hammer is locked directly to the cylinder in a rigid manner by means of a key which is inserted in the cylinder and engages one of a series of slots in the handle. The key is securely held in place and the entire lock arrangement is covered by a neat spring clip. An extra long striking end is provided on the piston and these hammers are furnished with either open or closed handle styles in 10 sizes, ranging from 1¼ to a 41in. stroke. These devices were fully described in the June Railway Mechanical Engineer, page 363.

Jacks for Unwheeling Coaches

A contribution to the efficiency and cleanliness of the coach repair track is made in the production of the new Whiting coach jacks which were described on page 392 of the June Railway Mechanical Engineer, and which are shown in actual operation at the convention by the Whiting Foundry & Equipment Company, Harvey, Ill. The upright members of the jacks are spaced a fixed distance apart laterally. One pair of jacks mounted upon trucks which provide for adjusting the spacing longitudinally for different lengths of cars. Heavy steps or knees on the jacks travel between the jaws of the cast steel columns or posts and are controlled by a revolving screw. Provision is made for raising each step to the sill of the car independently; then all four jacks can, by throwing a clutch, be controlled as a unit.

Carbide Lamp and Welding Torches

New 5,000 candle power carbide lamps, with 12 hours capacity on 8 lbs. of carbide—a cost of approximately 3 cents an hour—are being exhibited by the Alexander Milburn Company of Baltimore, Md. One of the interesting features of this new lamp is the carbide container, which being made up as a series of pockets will accommodate the safe loading of carbide and no more. This construction also facilitates disposition of the residue. The cotainer is simply withdrawn and the edge tapped lightly to dump the contents.

The same company is exhibiting its new oxy-acetylene torches. One is the "Cut Weld" combination torch, which is an all-purpose torch with interchangeable tips that can be used for cutting or welding as the case requires. Its type J or "quick-weld" is an equal pressure oxy-acetylene torch for welding. In this torch the gases are mixed in the tip. The torch head and tips have a flat seat which insures a perfect fit at all times, a new tip fitting the old torch without difficulty. It is stated that the equal pressure feature holds the oxygen and acetylene at equal pressure, making a softer flame, preventing flash-back and danger of oxidation of the metal. These devices were described in the June Railway Mechanical Engineer.

Davidsonized Cast Tool Steel

Seekers for the ultimate in production for machine tools who have tested and tried all makes of tool steels will doubtless be interested in Oscar F. Ostby & Company's line of cast tool steel which is being shown on the pier. A comprehensive review of the history of the production of this rather remarkable product was published on page 371 of the June Railway Mechanical Engineer. In the exhibit mentioned are samples of reamers, various types of milling cutters, counter-sinks, etc., which were cast in an electric furnace so nearly finished and ready for work that all that is required is hardening and grinding the cutting edges. The cutting possibilities of this steel are no less remarkable than the process of its manufacture.

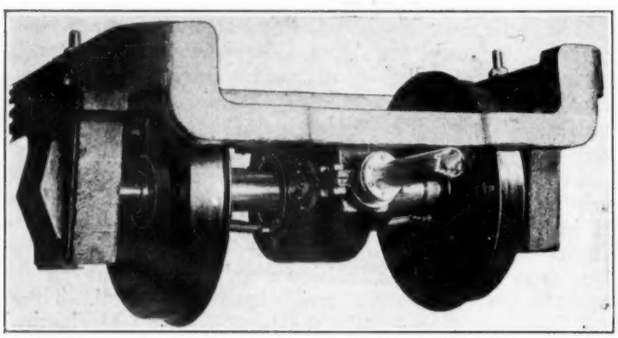
High Speed Ball Bearing Screw Jacks

Three sizes of the 75-ton jack and three sizes of the 50-ton capacity are described on page 343 of the Railway Mechanical Engineer for June. These jacks, manufactured by the Duff Manufacturing Company of Pittsburgh, Pa., are on exhibition and are specially recommended for handling all railway equipment. The load is raised with the use of a solid steel bar in the lever socket, using it like a pump handle. The load being

raised on each downward stroke. A positive clutch holds the load for the return stroke of the handle. Regardless of the speed with which the jack may be descending, the lowering handle may be stopped with absolute safety to within a thousandth part of an inch of any desired point. It is stated that so little effort is required to lower the load that the 75-ton jack can be operated by a boy with ease.

Spring Drive for Electric Axle Generators

The Safety Car Heating and Lighting Co., New York, is showing a new method of drive for car lighting generators, using a principle entirely new and unique in its application. Power is transmitted from the revolving car axle through springs connected to gear mechanism mounted on the truck, but free from the axle. Two split collars are bolted to the axle between the wheels, one at each end. Attached to each of these collars are three coil springs paralleling the axle and connected to the split drum. This drum surrounds the axle about midway between the wheels, but is of such internal diamenter as to give several inches clearance between the axle and the drum. A flexible shaft running at right angles to the axle is geared at one end to the drum and



Spring Gear Driving Mechanism Mounted on Axle

at the other end to the armature shaft of the generator, the generator being mounted on the car body. The drum and gears are mounted in a two-part housing, split horizontally and bolted together; the upper part is securely fastened to the truck frame.

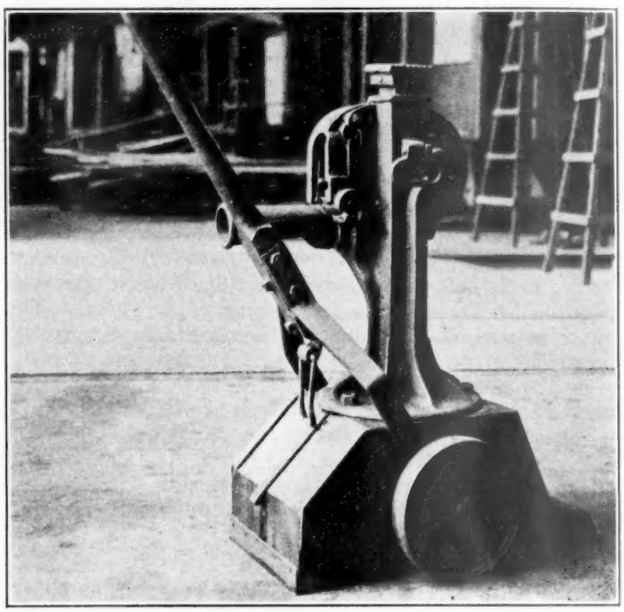
The generator being mounted in a fixed position on the car and connected to the axle drive by a shaft, necessitates providing for the variable relations between the car body and the axle when the car is traveling on a curved track. Compensation must also be made for side thrust through the truck equalizer springs and the variable pressure on the bolster springs. This is accomplished through the springs connecting the car axle with the geared drum. These springs not only give great flexibility in operation, but also provide wide latitude in assembling at the shops or on the road.

In case of flat wheels or other defects to wheels or axle, provision is made for quickly changing wheels and axle without changing any parts of the generator drive, thereby avoiding the necessity of carrying extra parts with each new axle. The same equipment can be applied to either straight or tapered axle without change, which is, of course, a great advantage.

The device is simple and compact and devoid of those intricacies which the operator and inspector usually condemn.

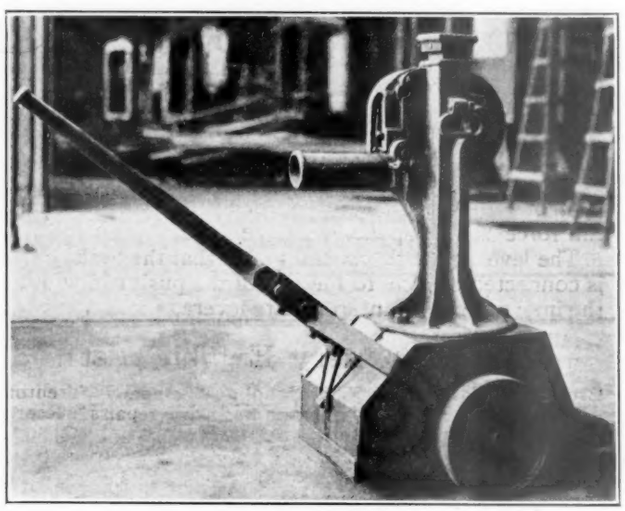
A Truck for Car Jacks

A convenient means of supporting and moving car jacks about the shop or yard is being exhibited by the Union Connector Company, St. Louis, Mo. The device consists of a heavy block, on top of which the jack is mounted and to which is attached a lever handle



The Union Jack Truck

and a pair of wheels, as shown in the illustrations. When not used, the handle of the jack is raised and the block rests directly on the ground. When the jack is to be moved the handle is lowered, carrying the wheels down



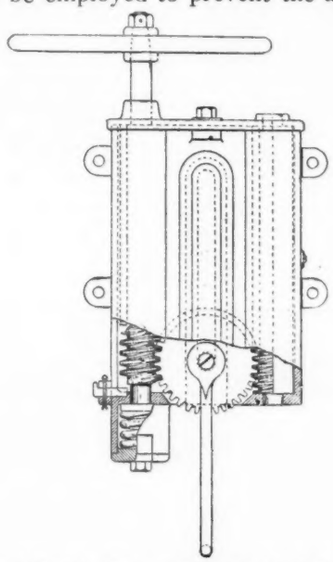
The Truck Ready to Move

with it and raising the block off the ground. The handle is locked in the moving position by a link, which engages a lug on the front of the block. When the jack is in use the block forms a solid foundation for the jack.

Worm Driven Hand Brake

THE DRAWING SHOWS A HAND BRAKE which has just been developed and is being exhibited by the Atlantic Hand Brake Corporation, Buffalo, N. Y. The brake is worm driven and connects directly to the end of the push rod without the interposition of levers. The device consists of a short shaft, at the top of which the handwheel is placed. On this shaft is a long worm, which meshes with a gear and the gear in turn meshes with a stationary worm segment placed parallel to and on the opposite side of the casing from the driving shaft. The movement of the driving shaft causes the gear to climb the worm rack, carrying with it a clevis link, to which the brake chain is fastened.

As the leverage at the handwheel is high, special means must be employed to prevent the application of



The Atlantic Worm-Driven Hand Brake

excessive force to the brake chain. The lower end of the shaft rests on a plate, which in turn rests upon a coil spring in a pocket below the body of the device. This spring is designed to close under 12,000 lb. As the brake is applied, the shaft gradually compresses the spring, until it goes solid. This brings the end of the worm into engagement with a lug inserted in the casing, which prevents further movement.

No ratchet or other locking device is required, as the geer will not back off. However, it is only necessary to give the handwheel a spin to release it. In applying, a spin of the wheel quickly takes up the slack and the full force may be applied with one hand.

The leverage of the worm is such that the brake chain is connected directly to the end of the push rod without the interposition of intermediate leverage.

Supplementary Exhibit List

Broschart Threadless Pipe Coupling Company, Trenton, Mo.,—Train line coupling for temporary repairs. Represented by J. L. Broschart. Space H.

Cleveland Osborn Manufacturing Company, Cleveland, Ohio.—The Edlund railroad and mill broom. Represented by Jos. L. Sullivan, T. A. Unsworth and William P. Carroll. Space H.

General Welding & Equipment Company, Boston, Mass.—Oxy-acetylene welding and cutting equipments. Represented by Thomas F. Stoddard. Space 537-538.

Southern Economy Device Company, Shreveport, La.—International adjustable lateral plate and International removable driving box. Represented by H. McDougal. Space 38.

A New Use for Fabrikoid

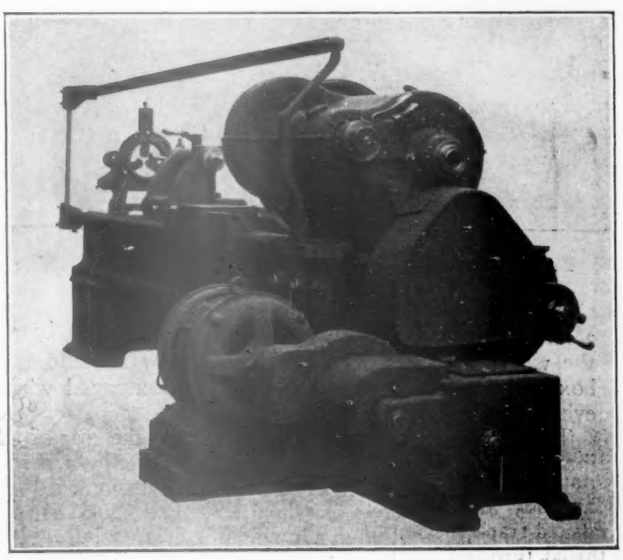
ONE OF THE EXHIBITS of the DuPont Fabrikoid Company, Wilmington, Del., is a Cadillac automobile, the body of which is completely finished with Fabrikoid in place of the usual enamel finish. This is the first trial which has been made in the use of Fabrikoid as an exterior finish where it is exposed to the weather. The body of the automobile was prepared for the Fabrikoid by the application of a coat of shellac. The Fabrikoid is then applied with cement. The entire exterior of the car body is covered in this way, including the top and the fenders.

The automobile on exhibit is the first one to which Fabrikoid has been applied and it has now been driven 15,000 miles, with the finish showing every evidence of a high degree of durability. So far as the test has been conducted the material has been unaffected by weather conditions or by the heat of the radiator and engine hood. A number of other automobiles have since been and are being finished with this material.

A Lathe with a Low Motor Mounting

A DISTINCT AND NOVEL ADVANCE in lathes of the type illustrated is characterized by the low mounting of the motor on a standard motor frame, upon which a large or a small motor may be placed to suit the nature of the work on any given size machine. A pulley may be applied and the motor disconnected so that independent or group driving is at the option of the user.

The use of the silent chain in the head effects a smoothness of operation which makes the drive practically noise-



Twenty-Four-Inch Motor Driven Bradford Lathe

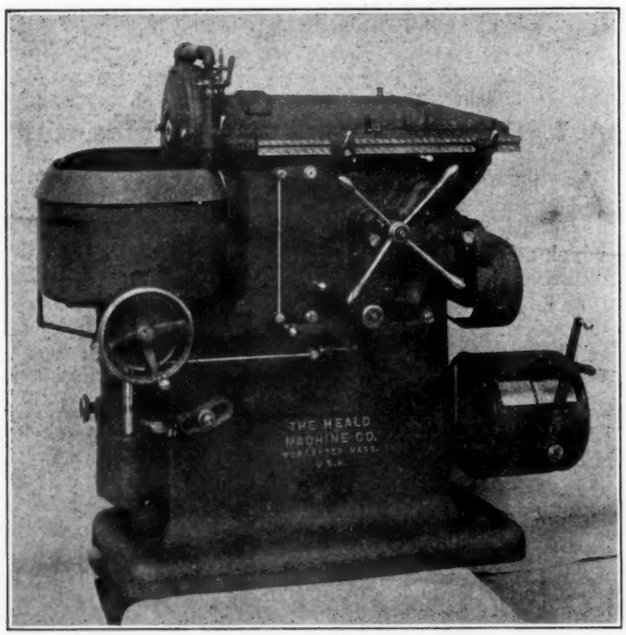
less and the spindle chatterless. Gear shifts in the selective driving gears in the speed box can only be effected after momentarily changing the drive through the shifter pole. In this gear shift no abuse of the mating gears is possible and speed changes are instantly made without noise or conflict. The back gear lever on the head not only engages the direct and back gear drives, but it is so arranged that in its central or disengaged position it effects a quick stoppage of the spindle by automatically applying through a direct friction brake. It is possible

to pull the work around by hand to inspect it with the friction brake applied.

The motor is used for driving purposes only and provision is made through simple mechanical means in the lathe itself for starting, stopping, reversing, speed changing and brake stopping. A 24-in. lathe of the type herein described, manufactured by the Bradford Machine Tool Company, Cincinnati, Ohio, is being displayed by the Swind Machinery Company, Philadelphia.

Rotary Surface Grinding Machine

THE ROTARY SURFACE GRINDING MACHINE shown in the illustration is built in two sizes, 8 in. and 12 in. regular equipment for both of which includes magnetic chucks. Prominent features incorporated in its design include the wheel slide which is a massive casting having a flat and "V" way which assures alinement. The wheel spindle is large and is mounted in a plain adjustable bronze bearing in the rear; it is lubricated through a large sight feed oiler. Automatic and hand feed for the wheel slide has been provided for by an automatic box and a pilot wheel which may be disengaged whenever the automatic feed is being used.



Front View of 12-in. Rotary Surface Grinding Machine

The main speed box which is situated on the rear of the machine furnishes power to the wheel slide by a three-stop cone and three speeds to the chuck through a bank of gears. The speeds of wheel slide and chuck are independent of each other allowing for a large latitude as regards speeds and feeds. The speeds to the chuck are controlled by a pull rod on the front of the machine.

The chuck spindle is driven by spiral gears, one of which is mounted directly on the spindle. The chuck bracket is adjustable to allow for the grinding of concave and convex surfaces up to an angle of 10 deg. The chuck feed is controlled by a hand wheel and vertical screw through a nut on the spindle sleeve. The chuck spindle is mounted on the ball bearings, while the vertical screw has a ball thrust bearing allowing vertical adjustment of the chuck. These machines are also equipped with an automatic vertical adjustment to the chuck which will feed from 0.0005 in. to 0.003 in. at each end of the wheel traverse.

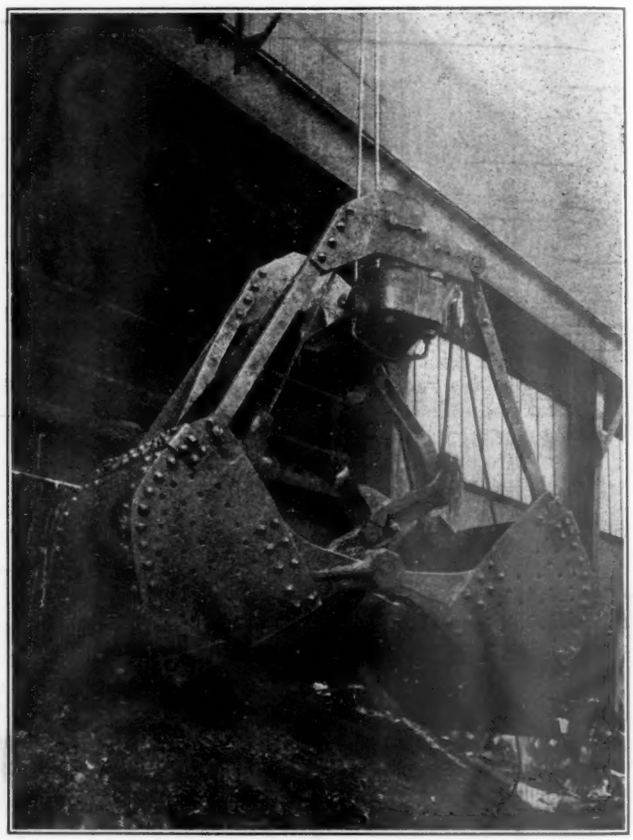
The water equipment includes a pump, tank, waterguard and connections, while a swivel joint in the distributing nozzle enables the operator to direct the flow of the water to any desired point.

The machine is self-contained, requiring but a single belt from the main line shaft or motor. Motor driven machines can be furnished if desired, the motor being placed where it is most convenient.

One of these rotary surface grinding machines is upon exhibition in the booth of its manufacturers, the Heald Machine Company, Worcester, Mass., who are also exhibiting a line of other types of grinding machines, one of which the Heald internal grinder, was illustrated and described in the June issue of the Railway Mechanical Engineer.

Single Hoist Grab Buckets

THE AUTOMATIC SINGLE HOIST GRAB BUCKET illustrated is recommended for use in the cinder pit; it will be noted that it is built without projecting parts which might catch on the sides of the pit. This bucket requires only a single drum hoist to handle it and is much faster in its operation than a two-line bucket because the operator has only one controller to handle. This grab bucket is automatic in operation, dumping at a fixed height controlled by a tripping hanger permanently attached to the hoist of the crane.



Brosius Automatic Single Hoist Grab Bucket

A special design of this particular type of bucket for use in ash pit service has been put out by Edgar E. Brosius, Pittsburgh, Pa., a specialist in the manufacture of grab buckets for ash handling plants; it has a capacity of 1½ cubic yards and is 3 ft. ½ in. wide, allowing a clearance between the walls of 4 ft. pit.